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# Professional development of technology integration into teaching: The perceptions of the providers of in-service education

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Professional development of technology integration into teaching: The perceptions of the providers of in-service education (Teemu Mattila)
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Using technology in teaching has been increasing and teachers' challenge is to maintain their professional competencies in digital pedagogy. The providers of in-service education facilitate teachers to develop in technological as well as in pedagogical skills. In Finland, continuing professional education is a part of teachers' work, but research literature shows that a great part of teachers never participates to in-service education programmes. Therefore, it is imperative to study how to make continuing professional development efficient in order for the teachers to gain from it as much as they can.

The aim of this master's Thesis is to find out how the providers of in-service education perceive the use of technology in education. This entails the perception of what ICT skills and technologies are beneficial in teaching. The other central aim is to find out how they perceive teachers' continuing professional development in technological skills and how quality in-service education can promote them. The theoretical framework used in the present thesis focusses on the theories and literature concerning professional development, both in the general respect as well as from the viewpoint of technological competencies. In addition, the research uses the Technological-pedagogical content knowledge framework (TPACK) as an analytical tool.

The analysis of this study will be carried by theory directed content analysis. The research material has been collected by electric questionnaire and an interview. The material consists of 7 participants' responses.

Technology was seen in conflicting light. On one hand, technology offers many possibilities in diversifying teaching and the development of technology was perceived to drastically change teachers' profession. On the other hand, the results corroborated findings about the increased demands of teachers' to be experts of digital pedagogy. They are expected to be motivated and to take responsibility in developing their competencies as well as learning on their own time. Teachers were perceived to be slow in responding to changes caused by rapidly developing technology, yet they were expected to keep up with it.

The participants are themselves experts in digital pedagogies, with backgrounds in the field of education as well as deep personal interest towards technology, which may benefit in focussing the training to pedagogies rather than specific technological skills. They provide both short- and long-term programmes, the latter of which offers the most advantages.

Key words: Continuing professional development, in-service education, Technological pedagogical content knowledge, providers of in-service education, ICT, information and communications technology, technology integration.

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Tietotekniikan käyttö opetuksessa on lisääntynyt ja opettajien haasteena on pitää huolta ammatillisesta osaamisestaan tieto- ja viestintäteknologian hyödyntämisessä opetuskäytössä. Täydennyskouluttajat auttavat opettajia kehittymään pedagogiikan ja tietotekniikan keinoin. Suomessa täydennyskouluttautuminen on osa opettajan työtä, mutta tutkimukset osoittavat, että osa opettajista eivät osallistu lainkaan täydennyskoulutukseen. Tämän vuoksi on tärkeää tutkia, kuinka täydennyskoulutuksesta saadaan tehokasta, jotta opettajat saavat täydennyskoulutuksesta mahdollisimman paljon hyötyä.

Tämän Pro Gradu -tutkielman tarkoituksena on selvittää täydennyskouluttajien näkemyksiä siitä, miten tietotekniikkaa hyödynnetään opetuksessa. Tämä pitää sisällään käsitykset siitä, miten tietotekniset taidot ja tietotekniset laitteet auttavat opetuksessa. Toinen keskeinen tutkimuksen tavoite on selvittää, kuinka he näkevät opettajien ammatillisen kehityksen tietotekniikan opetuskäytössä ja kuinka laadukas täydennyskoulutus voi tätä edistää. Teoreettisessa viitekehyksessä tarkastellaan opettajien ammatillisen kehittymisen teoriaa ja tutkimuksia sekä yleisesti että TVT-taitojen kehittymisen kannalta. Lisäksi tutkimuksessa perehdytään teknologian opetuskäytön teoriaan käyttämällä apuna teknologispedagogisen sisältötiedon viitekehystä, eli TPACK-mallia.

Tämän tutkimuksen analyysi toteutetaan laadullisen teoriaohjaavan sisällönanalyysin keinoin. Tutkimuksen aineistonkeruu on toteutettu sähköisellä kyselylomakkeella ja yhdellä puolistrukturoidulla haastattelulla. Aineisto koostuu 7 täydennyskouluttajan vastauksista.

Teknologia nähtiin tuloksissa ristiriitaisessa valossa. Teknologia tarjoaa monia mahdollisuuksia monipuolistaa opetusta ja teknologian kehitys katsottiin mullistavan opettajan tehtävät tulevaisuudessa. Toisaalta tutkimuksen tuloksissa näkyy opettajien lisääntyneet vaatimukset olla digitaalisen pedagogiikan osaajia. Heidän odotetaan olevan motivoituneita ja ottavan vastuuta oman ammattitaitonsa kehittämisessä sekä heidän odotettiin oppivan omalla ajallaan. Opettajia pidettiin ammattikuntana hitaana reagoimaan teknologian aiheuttamiin muutoksiin, mutta samalla heitä odotettiin pysyvän teknologian kehityksen tahdissa. Vastaajat itse ovat digitaalisen pedagogiikan asiantuntijoita, joilla on sekä kasvatustieteellinen tausta että syvä kiinnostus teknologiaa kohtaan, mistä saattaa olla etua täydennyskoulutuksen kohdistamisessa pedagogiikkaan irtonaisten digitaitojen sijaan. He tarjoavat sekä lyhyt- että pitkäaikaisia koulutuksia, joista tutkimustiedon valossa pitkäaikaiset koulutukset tarjoavat eniten hyötyä.

Avainsanat: Täydennyskoulutus, teknologispedagoginen sisältötieto, täydennyskoulutuksen tuottajat, täydennyskouluttajat, TVT, tieto- ja viestintäteknologia, tietotekniikan opetuskäyttö

# Contents

# 1 Introduction

Teachers of basic education in Finland are well prepared to develop their own knowledge and skill throughout their careers, thanks to their high quality of education with focus on supporting lifelong learning (Kaarakainen et al., 2017; Wilen, 2017). At the same time technology has become more accessible and commonplace and teachers are faced with demands of using Information and Communication Technologies (henceforth ICT) to support and improve their teaching (Okojie et. al, 2006; Jung, 2005). It is widely accepted, therefore, that teachers cannot cope in future schools around Finland without extensive ICT skills. Developing these skills is essential and far too many times it has become the responsibility of individual teachers to take the burden of their own training (Piesanen et al., 2007; Hämäläinen et al., 2015). Professional development is critical to ensuring that teachers become familiar with new methods of teaching, learn how to make the most effective instructional use of new technologies for teaching and learning, and adapt their teaching to the requirements of future society. Moreover, teacher need to take into consideration what competencies and skills their students will need in the future and direct their teaching accordingly. Teachers have the possibility, however, of participating to in-service education to improve their digital competencies and ICT skills for them to use technology in teaching more effectively and purposefully.

In-service education is mandatory by law for teachers in Finland, and therefore teachers are required to take part in in-service education while employers are required to provide sufficient education in order for teachers to develop and maintain their professional skills (Luukkainen, 2004). In-service education has, in fact, become compulsory part of teacher's careers partly in the form of VESO training that requires a certain number of half-days of full days to be spent educating oneself outside of teaching hours. Nevertheless, as many as one third of teachers of basic education in Finland did not participate in in-service education in 2007 (Opetusministeriö, 2009).

Rising demands for teachers, who already struggle under heavy stress and challenges in time management, are well documented (Aho, 2011), as well as multitude of reasons why teachers may or may not participate in in-service education. In-service training must therefore be effective and efficient so as to save teachers' working time and employer's resources.

The topic of this thesis is about the perceptions of in-service educators on their experiences in providing technology integration related training to teachers in basic education. The topic is

quite familiar to me, since I have taught a great deal of ICT-skills to my colleagues and the staff of basic education in my town while working as a subject teacher. Furthermore, I was a member of regional curriculum development team with the responsibility of the ICT section of the Finnish national curriculum 2016. One of my tasks was to help the educational staff of our municipality to develop their ICT-skills so they could work on the online curriculum document. This required some basic training such as group lectures and workshops which I provided. This work led to other tasks as well, such as providing some basic training sessions on how to use iPads in teaching.

Measuring the effectiveness of in-service education has been largely based on teachers' self-reports after participating in training (Guskey & Sparks, 1991), and so it may remain unclear whether training has affected change in their pedagogies. This has resulted for the need of more "elaborate and in-depth evaluations" of training in order to gain knowledge and develop practices in in-service education (Lawless & Pellegrino, 2007). Moreover, studies covering learning outcomes have been similarly limited. (Lawless & Pellegrino, 2007).

Both domestic and international surveys indicate similar findings into teachers' digital competencies and the availability of ongoing professional development. According to OECD TALIS report, teachers faced challenges regarding access to quality professional development (OAJ, 2019; Choi & Kang, 2019). Moreover, based on the survey conducted by the Trade Union of Education (OAJ, 2016), participants experienced that continuing professional development into ICT was too limited in scope. The content of the received education was usually getting acquainted with the basic software while the pedagogical utilisation of technology was almost negligible.

Consequently, based on the previous findings and my experiences as teaching professional who has provided in-service education, have made me think about developing teacher competences in integrating technology in the classroom from the viewpoint of those who teach the teachers: the providers of in-service education. The perceptions of in-service educators themselves, in fact, has been seldom studied, and there is very little academic research published on in-service educators' experiences on the matter, while on the other hand, there is an abundance of research having teachers as participants (for instance Wilen, 2017). Therefore, I find it very important to research this subject matter from this alternative point of view, since it may well contribute

to the increasing knowledge base of continuous professional development in integrating technology into teaching and learning, as well as gain useful information from a largely unexplored perspective.

The present thesis has concentrated on two major topics within continuing professional development to support integration of technology into teaching and learning. The first major topic focuses on technology integration into teaching and learning, particularly how digital technologies and competencies benefit teaching in classroom. Along with discussing the previous research done on technology integration, the present thesis will utilise a technology integration framework, TPACK, to aid in understanding and systematising the many ways in which integration can occur in teaching. The other major topic to be addressed is defining and discussing in-service education as regards how is it supported in Finland and what constitutes a quality, effective in-service education.

# 2. In-service education in Finland

The present section of this thesis will discuss the general background of continuing professional development in Finland such as the availability, formats and teacher participation to in-service education. This will also include discussion of how the terms in-service education and continuing professional development have been defined and studied in research literature. The following sub-section 2.1 will discuss teachers' professional development in general terms and subsection 2.2 will discuss the necessity of teachers' continuing professional development in conjunction with the most notable centralised efforts to develop and systematise it.

## 2.1 Background of teachers' professional development in Finland

In English, many terms have been used to discuss in-service education, and there appears to be an array of terms associated with in-service education in research literature, such as Continuing Professional Development, Professional Development, in-service education, in-service training and staff development (Li & Dervin, 2019). In Finnish, terms such as *opettajien ammatillinen täydennyskoulutus* (teacher professional development) and *opettajien ammattitaidon kehittäminen* (teacher professional competence development) are frequently used. However, for sake of clarity, the present thesis has adopted the terms in-service education and continuing professional development to refer to the above-mentioned nomenclature.

There are also some discrepancies concerning the usage of the terminology in question, and how it varies in different contexts. As of now, there is not been achieved consensus among Finnish policymakers nor researchers as to which term to use (Li & Dervin, 2019). Consequently, the author of the present thesis has noted a number of distinct terms used during the research and concurs with the issue. A succinct definition will therefore be necessary. According to Li and Dervin (2019), Continuing Professional Development is defined by OECD Teaching Learning International Survey (henceforth TALIS) as "activities that develop an individual's skills, knowledge, expertise and other characteristics as a teacher". While TALIS' definition encompasses both formal and informal education, the present thesis concerns in-service education and continuing professional development as *formal, structured activity which develops individual's professional skills, knowledge and expertise as a teacher*. Additionally, I have made a distinction between terms (*in-service) education* and (*in-service) training*, and I have

restricted the use of latter to practical, in situ activity while the former applies to in-service education in general.

The field of in-service education providers in Finland is complex and multi-layered. The providers of in-service education come from both private and public sector, and there is a multitude of various formats of provided in-service training available. The present section discusses what kind of education providers there are in Finland and what different forms of education are available.

According to Osaava report by the Ministry of Education, different formats of in-service education include.

- Personnel training provided by the employer, such as VESO training and other employer's organised training situated in schools or educational institutions.
- Other in-service training to update or develop personnel's skills. This includes, among others, participating to in-service training provided by the Trade union of education or other trade unions, Ministry of Education, Regional State Administrative Agencies or other in-service training by professionals.
- Postgraduate training or other long-term in-service training such as vocational specialisation studies or degree-oriented education.
- Other qualifying education such as teacher pedagogical studies or professional teacher education aiming for specific qualifications such as special teacher education, study counsellor education or separate university studies aiming for a degree. (Opetusministeriö, 2009)

As can be noted, there is a wide range of available in-service education in terms of duration as well as in terms of education's provider. Yongjian Li and Fred Dervin (2018), who studied Ongoing Professional development of the Finnish teachers (OPD), gathered a list of OPD providers and funders of in-service education. According to them, most of the providers are funded by National Agency of Education (NAE), the European union and the Nordic Council of Ministers.

NAE provides funding for CPD departments of universities and Universities of Applied Sciences, municipalities and groups of municipalities as well as to registered companies. European union funds both individual teachers and educational institutions, for instance through Erasmus+ programme. The Nordic Council of Ministers funds individual teachers and educational

institutions via programmes such as Nordplus. There are also private foundations that fund individual teachers and educational institutions. Furthermore, in Finland there are many cases where teachers themselves pay for their own training (Li & Dervin, 2018).

According to the study, the formats of training ranged from one day conferences and seminars to qualifying trainings with credits lasting several days or months (Li & Dervin, 2018). Courses pertinent to the present study are technology related in-service education programmes provided to teachers of basic education. Such courses were offered in general ICT, robotics and programming, and the topics of the courses were for example LEGO, Minecraft and Office 365. In addition, Brahea Centre at the University of Turku offered one-year courses that provided training for topics such as Learning and learning environments for the school of the future, using iPads in teaching, using laptops and tablets and lastly a course focused on digital gaming and learning. (Li & Dervin, 2018)

The majority of in-service education in Finland is concentrated on short-term or one-off training sessions such as VESO-days, conferences and workshops. Teachers of basic education participated in in-service training on average of 6,3 days per person during 2010 (Opetushallitus, 2011), three of which is compulsory VESO-training days. Although short duration training programmes are considered more convenient and desirable among teachers and headteachers (Heikkinen, 2007), there is an increasing need for more profound, thorough and long-term programmes. Helin (2014) asserts that projects centred around professional development need to be sustainable and efficient rather than infrequent and of short duration. Accordingly, changing teaching practices is difficult when based only on participating in short training sessions, as workshops or conferences have not led to desired outcomes. Short duration education such as day-long sessions are therefore not presumed to be of great impact in terms of individual or collective development since the content of the training remain superficial (Helin, 2014).

### 2.2 The need of professional development in Finland

Finnish teachers are largely responsible for their own professional development, and as will be discussed in the present section, there are significant differences in digital competencies between teachers. Teachers who are more oriented towards professional development find it easier to apply their previously acquired professional skills and are able to identify their own needs in learning (Raasumaa, 2010). However, there have been several nationwide initiatives and projects to develop and systematise teacher professional development. According to several studies

and surveys, there is an increasing demand from teachers themselves, educational personnel and policymakers, among others, to focus on developing ICT skills.

According to several reports carried by Ministry of Education during 2006 – 2007 (Opetusministeriö, 2009), teacher participation in in-service education was in decline during 1998 – 2005. In order to ensure professional competence and improve opportunities for continuing education within the education sector, the Ministry appointed a working group Osaava to prepare the requirement to be set for improving the situation. Osaava working group proposed that the education providers, such as municipalities, federations of municipalities as well as private education providers, would be obligated to systematically ensure that education personnel participate sufficiently in in-service education, and moreover that national Osaava programme would be set up to support and monitor this obligation. The programme set a specific goal to target personnel in education sector who had the least possibilities to participate, and therefore had the greatest need for in-service education (Opetusministeriö, 2009).

As a follow-up to the Osaava programme, The Centre for Educational Assessment (CEA) in the University of Helsinki published a report where the success of the programme was analysed. The report stressed the significance of networking and co-operation which have emerged during Osaava programme, particularly of the continuing co-operation between the Ministry of Education, Finnish Agency of Education and regional state Administrative Agencies. Accordingly, the report anticipated tentatively that several in-service education networks and initiatives birthed during Osaava programme would continue to exist and provide to be beneficial. Furthermore, in-service education provided during Osaava programme has been well targeted to those groups that were intended, including personnel in basic education as well as vocational education and adult education. (Opetusministeriö, 2009)

In 2015, as part of its strategic program, the Ministry of Education and Culture launched the Key project 1, *New learning environments and digital materials to comprehensive schools* (Uudet oppimisympäristöt ja digitaaliset materiaalit peruskouluihin), in order to make Finland a leading country in education, competence and learning. The project entailed for instance, modernizing learning environments, utilizing the opportunities of digitalisation as well as improving teachers' skills (Husu & Toom, 2016). Based on the survey carried by the Ministry of Education (2020), activity of teachers' participation in professional development increased during 2018, partly because Government's Key project 1 (as discussed previously) distributed state funding to education providers for tutoring, experimentation, development as well as innovation, with

the result that in 2018, 88 percent of the teachers of basic education participated in in-service education (Opetushallitus, 2018).

To develop and reform teachers' skills in all stages of teachers' professional career, pre-service, induction and in-service education, the Ministry of Education and Culture established the Teacher Education Forum (Husu & Toom, 2016). Subsequently, the Finnish Education Evaluation Centre (FINEEC) provided information on the efficacy of the Key project 1. Among the reported findings, FINEEC recommended that the reform of teacher education requires strategic guidelines from education providers to ensure developing teachers' skill throughout their careers, and each teacher should be provided an individual, monitored development plan with adequate support from educational leaders (Niemi et al., 2018).

Among more recent projects to develop teachers' digital competence, the Agency of Education and Culture launched the Comprehensive Schools in the Digital Age (Digiajan Peruskoulu) which ran in 2016 – 2018, and shortly after, based on the positive results of the project, it was continued as the Comprehensive Schools in the Digital Age II. The first part of the report included among others results of surveys and discussion on digital competence of pupils and teachers during 2017 and 2018. During the follow-up period, the report stated a slight improvement in measurements of teachers' responses about their digital competencies. About one third, 34 % of teachers reported that they received a sufficient amount and quality of in-service training in ICT skills in 2017 while the percentage increased to 36 % in 2018. Additionally, the measurements included the need for more in-service education among teachers, and the reports stated 59 % and 61 % of participants felt they needed more in-service training in ICT skills in 2017 and 2018, respectively. (Kaarakainen et al., 2017)

It is notable that the report found marked differences in digital competence and the need of more in-service training in ICT skills between different age groups and gender, although ICT skills have improved in all groups. The report recommends therefore that municipalities should increase in-service education in ICT skills particularly to teachers aged over 40. (Kaarakainen et al., 2017)

# 3 Integrating technology into teaching and learning

The present section of this thesis will discuss technology integration into teaching and learning from two perspectives. Section 3,1 will first describe what is meant by technology integration, and then discuss about challenges teachers face when teaching with technology. Section 3.2 will present the Technological Pedagogical Content Knowledge (TPACK) framework and how it is used to conceptualise technology integration.

## 3.1 Technology integration into teaching and learning

Often the use of technology in teaching and learning is seen as something that automatically improves student outcomes and is beneficial to learning. However, discussing the use of technology in such simplistic manner can neither benefit the students or teachers. Integrating technology into teaching is a complex task that includes many approaches and elements to be examined, such as what is the content matter to be taught in training, i.e., learning about technology, learning how to use a specific piece of technology or learning to integrate technology into instruction (Lawless & Pellegrino, 2007). It is critical that research separates and contrasts the various elements in question, whether it concerns the use of technology, pedagogy or a mix thereof. Therefore, in order to provide meaningful context to technology integration, a distinction has to be made between different approaches of developing teachers' digital competencies.

There is an increasing awareness in research literature about differences between technology integration into classroom teaching and teaching specific ICT skills. While the latter constitutes technological skill-oriented approach, which may include separate technological skills the former can be described as more holistic approach where the use of technology is integrated into teaching (Hennessy et al., 2007; Okojie et. al, 2006; Lawless & Pellegrino, 2007) to incorporate technological resources and technology-based practices into the daily routines, work, and management of schools and teachers (Lawless & Pellegrino, 2007). Further, according to Okojie et al., (2006) integrating technology includes the selection of the technologies used as well as how to use it in concordance to evaluation and customizing it so that it addresses instructional problems. Technology integration into teaching is therefore a routine and seamless process in which technology is "weaved" by the teacher into their teaching practices and the instructional environment to assist in teaching and learning (Lawless & Pellegrino, 2007).

The use of technology in itself does not guarantee improved student outcomes, per se, but rather coherent instructions and assessment with the help of different models and theories of learning, instruction and assessment, ergo pedagogy (Koehler et al., 2011 among others). Technology, on the other hand, facilitates teaching, making it easier to implement while offering new and often better approaches to teaching (Lawless & Pellegrino, 2007). Moreover, research has indicated that teachers' increased digital competences diversify pedagogy and they will have better opportunities to take into account and support the individual student's progress as well as to give them personalised feedback on their tasks (Harris, 2017; Kankaanranta & Puhakka, 2008). In addition, using digital technologies may prepare students for future endeavours such as entering working life, job search and networking (Neittaanmäki & Kankaanranta, 2016).

Nevertheless, integrating technology into teaching has many challenges which teachers need to overcome (Koehler, Shin & Mishra, 2011; Brinkerhoff, 2006). Among the difficulties are, for instance, the rapid technological advancement that makes keeping up with the technology difficult (Harris, Mishra, & Koehler, 2009; Wilen, 2017). Many teachers are equipped with the skills they learned during the initial teacher training and learning new skills may have proven too time-consuming or inconsistent with the teachers' pedagogical beliefs (Koehler et al., 2011). Moreover, each technology has its own affordances and constrains that allows for very specific tasks (Koehler, Mishra & Cain, 2013; Harris et al., 2009) which require for very specific skills, for instance, how to make a web page or how to create and edit a stop motion animation. Often it is the case, that these skills do not have a "connection to broader issues of technology integration with actual classroom practice" (Koehler et al., 2011). Consequently, use of technology is often seen as "technocentrist" (Papert, 1990) and therefore without a specific pedagogical goal, which therefore may hinder learning (Zinger et al., 2017). To address these challenges and to aid in the task of understanding the complex relationship between technology and pedagogy, the present thesis will appropriate a TPACK framework intended precisely for this, a way for think about effectively integrating technology, which will be discussed in the following section.

### 3.2 TPACK framework

As noted previously, integrating technology into teaching is rather multifaceted issue, involving the interplay of several elements which may include among others what and how a particular piece of technology is used, what is being taught and how it can be taught. The present thesis

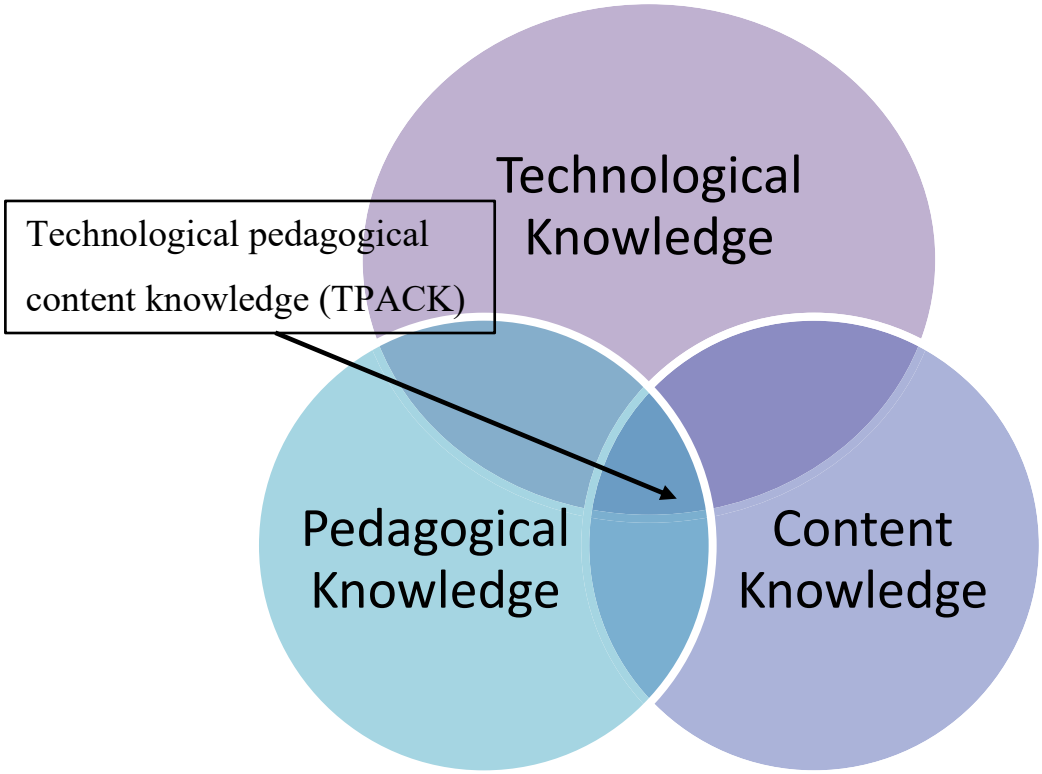
implements a TPACK framework that addresses these questions by connecting technology to curriculum content and pedagogical approaches while providing researchers and teachers the understanding how effective teaching can be produced with educational technologies (Koehler et al., 2011).

TPACK has been described as an extension of Shulman's (1987) theory of pedagogical content knowledge (PCK). According to Shulman (1987), managing pedagogy and content knowledge of various school subject as individual areas of knowledge is not sufficient to provide education of high quality. In the PCK model, pedagogy is about teachers' compounded knowledge and skills in teaching, instructing and how to apply different styles of teaching in practice, while content knowledge relates to teachers' knowledge and understanding of the school subject (Koehler et al., 2013). Together, these form pedagogical content knowledge which allow teachers to apply different teaching strategies into teaching specific content (Graham, Borup & Smith, 2012).

A third individual component, Technological knowledge (Mishra & Koehler, 2006) has been added into Shulman's PCK model. Technological knowledge is about the competencies to use various technologies, such as how technology can help to achieve particular goals and tasks and how to stay up to date with technological progress (Mishra & Koehler, 2006). According to Koehler et al. (2013), when planning teaching, teachers need to take into consideration the context and content to be taught while being able to choose the most suitable technology for the task. Figure 1 shows the TPACK framework's three core knowledge components and their interactions with each other.

**Figure 1.**

*TPACK framework's core components* (Koehler et al., 2013).




As can be viewed from Figure 1, the model's core components, the Knowledge areas overlap with each other whereby forming a central area called Technological pedagogical content knowledge. This helps to conceptualise how teachers build their entire knowledge base about teaching and technology concurrently. In essence, teachers can develop their TPACK to enhance their efficiency as teachers who teach with technology rather than focussing on learning technological skills in isolation.

Although the TPACK model is an abstraction of sort, Mishra and Koehler (2006) noted that the value of such framework lies in its ability to describe certain phenomena, guide inference making based on collected data and finally apply it to other contexts. Concerning the present thesis, TPACK framework functions as a *classification scheme* (Koehler et al., 2011) in the analysis of the collected material (see chapter 4) which hopefully provides insight as well as analytical tools into researching the phenomena in question.

# 4 Developing teachers' technology integration into teaching through professional development

While the previous section discussed the topics of using technology in teaching and integrating the use of technology into teaching, the present section of this thesis will concentrate on the various research and studies focussed on developing teachers' digital competence through in-service education. The aim of this chapter is to provide some basis on what constitutes as quality professional development and what challenges, obstacles or barriers teachers may face when learning ICT skills. Moreover, the section discusses various approaches to evaluating the effectiveness of in-service education as well as considerations of the best practices when designing programmes centred around professional development of technology integration.

As noted earlier, there is a scarcity of academic research on teachers' continuing professional development as regards to technology integration into teaching. In their literature review, Lawless et al., characterises the situation as "markedly weak" and "extremely limited in scope", particularly regarding the recommendations on what makes a difference (2007). In addition, Wilen conducted a literature review of technology related in-service education in his licentiate thesis (2016, as discussed in Wilen, 2017), the results which are included in his doctoral thesis (2017) about needs and challenges of teachers in-service training in the region of Middle–Finland. The literature review included 285 peer reviewed articles that only partially discussed the topic of developing teachers' ICT skills in in-service education. He asserted that the research literature has been limited to international publications with only a few notable exceptions in Finnish language. He further stated that the research literature was limited on the topic on the grounds of several reasons, which may be for instance because of lacking "critical perspective". Moreover, literature review by Daly, Pachler and Pelletier (2009) reported similar findings, stating that dedicated studies concerning professional development of integrating technology into teaching were limited in number and contained few large-scale studies or those focussing on long-term development.

In conclusion, research literature concerning continuing professional development of technology integration is limited in both quality and quantity. Nevertheless, the following sub-sections will aim to utilise what is known about the topic by exploring the current best practices and pitfalls of professional development centred around technology use in education. Subsection 4.1 will discuss the various constraints and barriers associated with professional development

programmes while subsection 4.2 will concentrate on what constitutes an effective, quality in-service training.

### 4.1 Barriers and challenges in professional development of integrating technology

In terms of continuing professional development, Brinkerhoff (2006) has evaluated the effectiveness of a long-term professional development programmes intended to increase the use of technology in instruction. According to the study (Brinkerhoff, 2006), there are many challenges for the teachers to integrate the use of technology in the classroom and fully capitalise on the affordance technology provides. Brinkerhoff further groups these barriers into four categories: resources, institutional and administrative, training and experience in addition to factors concerning teachers' attitude or personality (2006). While resources such as insufficient or out-of-date digital devices have been identified as the most common barrier, the present thesis is mostly interested in institutional barriers which includes insufficient professional development focused on developing teachers' ICT skills.

Institutional barriers relating to insufficient professional development may include issues concerning teachers' perceptions of integration of technology and focussing the training on specific skills, such as in a study conducted by Loveless (2003), where teachers saw technology as a distinct subject akin to other school subjects. Integration of technology in teaching was largely a question of teachers' attitude and competence in specific skills rather than developing pedagogy around the use of technology. This suggests, similar to the study by Daly et al. (2009), that there seems to be an "over-emphasis on skills development without sufficient opportunity to reflect on learning and teaching as part of development activities". Although training specific skills is important in integrating technology into teaching, it is by itself inadequate for teachers to develop their pedagogy and may not have the desired impact on the quality of teaching or overall change in teaching practices (Daly et al., 2009). This may lead into surface level adoption in the use of the technology without a guarantee of change in the actual teaching practices, for instance an apparent teacher use of a newly installed smart screen can be seen as sufficient training while there is no indication that changes have happened in the quality of the learning. Too much focus on developing a set of skills can have also misleadingly signal to decision makers that much training has been taken place, even though the quality or the change effected by training has been negligible (Daly et al., 2009). Daly et al., further noted that teachers have deep-seated habits and beliefs how they use technology in teaching, and that teachers need to

consolidate and deepen their understanding of how to use the technology to improve teaching. It is often the case that they have to move on to another technology before they are proficient enough in the use of the previous one (2009).

Aside from attitudinal issues, other barriers arise from practical matters such as time constraints, inadequate follow-up support or irrelevant training for teachers' specific needs. Cuban et al., (2001) studied teachers in two high schools in the fabled Silicon Valley, California. The aim of the study was to find explanations and confirmations on why, despite easy access to technologies, the prevailing teaching practices were sustained instead of transformed in a setting both heavily invested in technology and advocated by the schools' stakeholders. The teachers who participated in the study were characterised by Cuban et al., (2001) as "technology leaders" and "early adopters of digital technologies". Nevertheless, the study indicated that teachers faced time constrains and insufficient scheduling that affected adversely their preparation time to plan "technology infused lessons", explore technology or simply collaborate with their colleagues. What is more, time constraints affected also their professional development in integrating technology. Teachers were expected to participate in training during inconvenient times, often after school hours. Further, the training was provided by specialists hired by the school, and despite possibilities of engaging in on-site tailored sessions concerning teachers requests, the training offered was irrelevant to their specific needs.

A study carried by Chrystalla Mouza (2002) reports the findings of a professional development programme for helping teachers effectively integrate technology into teaching. Although the results indicate the programme was effective in terms of improved technological skills and new pedagogical strategies associated with the use of technology, additional benefits of the study include insight into factors that make teachers professional development effective. Mouza notes that insufficient support following a "traditional sit-and-get-training" session have proven to have adverse effects on teachers' integration of technology in teaching. Lack of follow-up support is, in fact, according to Mouza, one of four major reasons why many professional development programmes fail to reach their goals. The three are that the training does not situate at school, it is irrelevant to actual classroom activities, and finally that the training fails to address individual needs and concerns of the teachers. The study further states that the frequently used training model in which an outside expert introduces new methods of teaching proves to be unsuccessful in preparing teachers to respond to the demands of their profession (Mouza, 2002).

Literature review conducted by Daly et al., (2009) reported similar findings to those previously discussed. Although there are a number of efficient programmes to develop teachers' professional competencies in integration of technology, they are often localised and do not necessarily guarantee access to high-quality in-service education to all teachers. The study reports also findings of professional development programmes which are "poorly planned" and do not take into account teachers' individual needs or their level of competence in using technology. The role of school's leadership and administration was also seen as important to effect changes in pedagogical practices, particularly in devoting dedicated time for teachers to consolidate and develop their competencies in the use of technology (Daly et al., 2009). Moreover, headteachers were seen as having an important role in learning communities as enablers of open and democratic approaches to professional development programmes who encourage teachers to support each other and experiment with teaching (Daly et al., 2009).

Li and Dervin (2018) interviewed four professional providers of in-service education. In summary, the informants characterised the continuing professional development in Finland negatively. They identified the field of in-service education as complex and wanted it to be more research oriented with strong backing from National agencies. Another key feature was the strong presence of providers of private actors and digital companies that sell devices such as iPads and then provide single day training to teachers. According to their study, the field is in need of coherence and long-term programmes to support teachers' professional development. As problems of continuing professional development. the study specifically stated the issue of decentralised decision making as regards to funding and availability of training. Since municipalities of Finland make their own decisions about providing continuous professional development to teachers, there is great variation in the availability of in-service training in Finland. Furthermore, lack of money was identified as another key problem, which resulted not only in the availability of training but the quality as well. Since municipalities often are required to accept the least expensive offer in a bid, this may have also affected adversely in the quality of the training. (Li & Dervin, 2018)

Concurrently, some of these issues were discussed previously in this section and adds up to the list of what is not effective professional development. However, what actually is effective professional development is discussed in the following subsection.

## 4.2 Best practices in professional development of integrating technology

There is an increasing number of studies and theories on what makes professional development of technology integration effective and of high quality, and the present study will discuss some of the key findings. As noted earlier, the list of deficiencies associated with professional development programmes is considerable, yet it also offers some insight to best practices and what issues are to be considered for effective professional development of technology integration.

According to Mouza (2002), effective professional development is organised around practical, classroom problems while providing access to outside expertise. Training is supported by the community at school and it is based on adult learning theories (Lewis 1998a; Lewis 1998b). Moreover, effective training provides teachers continuous, on-site support and assistance while they develop their competencies in practice.

As Daly et al., assert (2009), some of the features of a successful professional development programmes are centred around teacher collaboration and collective efforts in the learning community. In such environment, teachers are prepared to take responsibility for their own learning by proactively co-operating with their peers and administration by discussing and developing their ideas, plans and experimenting. Teachers in turn are provided by opportunities for critical reflection to deepen their understanding and improve their teaching practices. Such cooperative planning takes into consideration the varying levels of competence among teachers while also allowing for inclusion of external experts and ICT experts. Daly et al., stress the role of schools as *communities of learning* in the regards that social relationships are central in how teachers share information and ideas, in both formal and informal situations. The main advantage of such approach, accordingly, is that the professional development remains in context, i.e., is relevant to curriculum.

The findings of what constitutes a quality effective professional development can be crystallized by Judith Harris (2016), who studied a range of professional development models concerning TPACK related professional learning. According to her,

> "research about teachers' professional learning shows that it is most effective when it is active, reflective, sustained, job-embedded, coherent, in-depth, and focused upon students' curriculum-based learning within professional learning communities". (Harris, 2016)

These findings are similar to those discussed previously, and in order to summarise the issues discussed in the present thesis, a table was compiled where the preferred ways of doing things, i.e., best practices are presented along with the practices which are seen as failed or avoided in research literature. Table 1 has been distributed into four groups based on Brinkerhoff's (2006) classification scheme, as discussed previously.

**Table 1.**

*Barriers and best practices concerning continuous professional development of ICT.*

| | Barriers | Best practices |
|---|---|---|
| Resources | Presence of private actors with limited follow-up support<br>Availability of training<br>Quality of training | Sustained, long-term programmes<br>Backing from National agencies |
| Institutional and administrative | Time constraints<br>Inadequate follow-up support<br>Training irrelevant to individual needs<br>Decentralised decision making<br>Training outside school context<br>Irrelevant to actual classroom activities<br>Inappropriate training models | Ample support from peer groups and community<br>Onsite support and assistance (substitute and/or special needs assistant)<br>Time devoted to reflection and critical thought |
| Training and experience | | Centred around practical, classroom problems<br>Authentic classroom environment<br>Access to outside expertise<br>Based on adult learning theories<br>Research oriented<br>Coherent<br>Curriculum-based learning<br>Active<br>Opportunities for critical reflection<br>In-depth<br>Relevant to individual needs<br>Co-operative<br>Adequate follow-up support |
| Teachers' attitude or personality | Perceptions of integration of technology<br>Technology seen as separate subject area | |

# 5 Research questions and aims

The topic of the present thesis is the perceptions of the providers of in-service education towards teachers' professional development in integrating ICT-skills in the classroom. As noted in chapter 3.1, teachers' technological skills are often poorly integrated to classroom teaching and as a way to develop their competencies teachers participate in continuing professional education. However, as discussed in chapter 4.1, pedagogical approach is seldom used in in-service education (see Wilen, 2017 among others), and also, as discussed in previous chapter, there are many other challenges and barriers teachers face in their professional development, such as time constraints, inadequate follow-up support or just poor planning.

The providers of the in-service education have a crucial role in implementing, planning and providing the training necessary for teachers to develop their professional competencies. As experts of their field, they are imperative in supporting teachers' development (Barak, 2007). However, as previously indicated, perceptions of the providers of in-service education is a field of study which has been poorly explored, and is therefore in need of additional research. All of this coincides with my experiences as a part-time provider of in-service education withing my working community. The present thesis is thereby a means of procuring the providers of in-service education a voice of their own.

The aims of the research, therefore, are to explore the perceptions of providers of in-service education as comprehensively as possible. This is done by listening what the providers have to say about their field of work of providing continuing professional development to teachers and how they view the aspects of pedagogy, content and technology in teaching. To achieve this, the research questions need to cover both the use of technology in teaching, and the means of developing the skills associated with teaching with technology. The aim of this research has subsequently been reduced into the following research questions:

> Research question 1: How do the providers of in-service education perceive technology integration into teaching and learning?
>
> Research question 2: How do they perceive *developing* the knowledge and skills needed for efficient classroom ICT integration?

# 6 Methodology

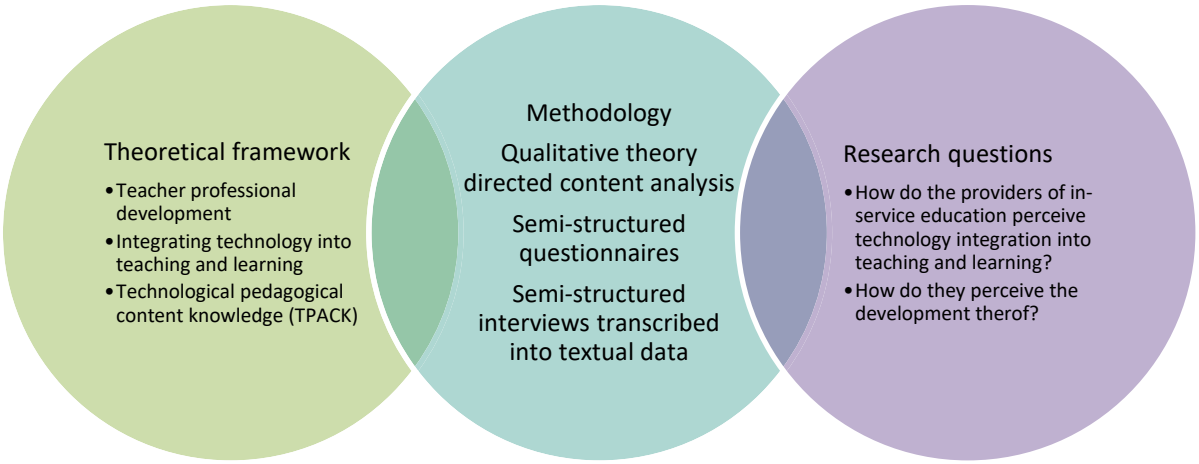
In the present chapter of this thesis the methods used in the study will be first presented and justified. This is followed by the presentation of the context and the participants of the study and data collection methods, after which the process of analysing the data will be discussed.

The present research has adopted qualitative research approach as its methodology, using theory directed content analysis as a means to classify and interpret the collected data. The participants of the research are individuals who provide teachers of basic education some form of in-service training related to technology.

The research questions are poised to shed light in the ways in which technology is used in teaching from the viewpoint of providers of in-service education. In order to run through the main point of this thesis and to provide a frame of reference into the structure of this study, a systematic collection of the issues presented in this research was collated into Figure 2.

**Figure 2.**

*Research framework and structure of the thesis.*



## 6.1 Data collection and participants

The data of this thesis was collected through semi-structured questionnaires and one subsequent interview and was analysed with qualitative theory directed content analysis. The participants of the research were selected as individuals who work or have worked in recent past as providers of in-service education in matters related to ICT and have provided any form of training to teachers of basic education in Finland.

Initially there were two possible alternatives how to conduct data collection, a semi-open questionnaire hosted by online provider, or an interview. Using electronic questionnaire was chosen because of its many advantages over interview method: it is efficient, it saves time, and it makes possible to gather a large collection of material. In addition, the presence of the researched does not influence the respondent's answers. (Valli, 2018) Furthermore, according to Valli and Perkkilä (2018), electronic questionnaires reduce the researchers work by having the data already in textual form and precisely how the respondents have intended, which improves the reliability issues caused by typos in the transcription phase. On the other hand, using electronic questionnaire does not allow for researcher to specify answers, so careful planning is required in planning the questions (Valli, 2018).

Using questionnaire as the only method of data collection proved not to be possible. One respondent wished to be interviewed instead of having to type the answers, and an interview was arranged. How the interview was organised and planned is further discussed in chapter 6.1.3.

### 6.1.1 Context and the participants

It is characteristic of qualitative research that the number of cases used in research may be small and the emphasis is in the quality of research (Eskola & Suoranta, 1998). Moreover, as this is a thesis, rather than for instance article or dissertation, the size of the material should not be considered as the most important criterion (Tuomi & Sarajärvi, 2018). As Mack et al., (2005) state, in qualitative research, only a subset of population is selected as the participants of the study, which is predominantly determined by the research objectives and the characteristics of the study population. The present thesis has chosen a form of purposive sampling as the preferred strategy of collecting material, which enabled to set certain preselected criteria relevant to research questions (Mack et al., 2005) and to restrict the participants to a selected group of

people. According to Sargeant (2012), subjects sampled have to be capable of informing important facets and perspectives relevant to the phenomenon under research, and the criteria in such cases may be for instance, professional role, perspective or experience level. This is what Tuomi and Sarajärvi (2018) call "elite sampling", where the informants are people who are assumed to know much about the topic and likely to answer "better". The researcher has not determined a fixed sample size prior to data collection. While sample sizes are, according to Mack et al., (2005), "often determined on the basis of theoretical saturation", the present research has aimed at collecting as much data as possible, given the practical limitations of time and resources available at the time. The preselected criteria are as follows:

> Persons who work or have worked in recent past as providers of in-service education in matters related to technology and have provided such training to teachers of basic education in Finland.

These criteria enable the research to focus on people who are most likely to know about and have insights into the research topic. Subjects were recruited by email. Prior to data collection, a list of possible providers of in-service education was collected by internet search, using key words such as "täydennyskoulutusta" (in-service education) and "täydennyskoulutuskeskus" (centre of in-service education among others. The purpose of the search was to locate and identify individuals, institutions and companies who provided in-service education or were likely to employ such persons. Similar search was also conducted in the closed Facebook group called ICT in Education. In addition, I was provided by my thesis supervisor with names of several contacts who were said to be possible candidates for recruitment. The email for recruitment contained an internet link to questionnaire, as well as a covering letter that addressed the questionnaire intended for in-service educators who give ICT related training to teachers. It can be therefore reasonably assumed that those who fill out the questionnaire identify themselves as in-service educators and represent the criteria for recruitment.

In total there were 7 participants in the study, six of who responded through the online questionnaire and one of who answered the questions through an interview. Information of participants' work and educational history, current form of employment and the breakdown of the kind of training they provide is shown in Table 2. The background information was acquired by two open questions where the respondents were first asked how they arrived at providing in-service education and then to describe their occupational history. Table 2 includes in addition a breakdown of the type of training they provide, which was acquired by a structured multiple-

choice question with five possible choices. The questionnaire was designed so that when an option is selected, it automatically presents a specifying question asking whether or not that technology was originally developed for educational use.

**Table 2.**

*The participants of the study.*

| Participant | Background in education | Form of employment | What type of training is provided by the participant | | | | |
|---|---|---|---|---|---|---|---|
| | | | Specific software | Specific technology or device | Software related to a specific school subject | Learning environments | Other (education related products or technologies) |
| Participant A | Yes | Self-employed | Yes | Yes | - | Yes | - |
| Participant B | Yes | Self-employed | - | - | - | - | Pedagogical solutions |
| Participant C | Yes | Not available | Free software | - | - | Yes | Free software |
| Participant D | Yes | Not available | Several | Several | - | Several | Various |
| Participant E | Yes | Private sector | Yes | - | - | - | Pedagogical solutions |
| Participant F | Yes | Self-employed | Yes * | Yes * | - | - | Several |
| Participant G | Yes | Public sector | Several | Several | Several | Several | Several |

Asterisk (*) denotes that the specific software or technology is originally designed to be used in educational purposes

As shown in Table 2, all of the participants have some form of educational background. As the results were collected by open questions, the respondents provided additional detail to their backgrounds, such as whether they have worked in education or have a degree in the field of education. The participants' current form of employment was acquired by similar means. As can be seen, one participant is employed in the private sector while one works in the public sector. Three participants described as being self-employed. Two participants' form of employment were not inferred from the responses. The situation is not so clear-cut as presented, because some participants offer training alongside their work and work accordingly as part-time providers of in-service education. For the purpose of this thesis, however, it is not of consequence.

Table 2 displays moreover the kind of training provided by the participants, such as whether the training concerns a particular piece of technology, software or other topics. I have tried to

include as much detail as possible without naming specific software or technologies. Since some participants are professionals who may represent certain businesses and their products, I have purposefully omitted brand or product names so they cannot be identified through them. Nevertheless, as can be seen, the variety of offered training is considerable. While some offer training in particular software or technologies, some have a range of technologies at their disposal. Two of the participants (B and E) stated that they do not offer training in particular technologies but rather pedagogical solutions in which the use of technology plays a significant role. With this aspect in mind, they were accepted as participants of this study since they meet the criteria of the sampling method.

### 6.1.2 The questionnaire

The questionnaire was hosted in the online service Webropol, which proved to be convenient in that respondents could fill out the form with any electronic devices such as laptops or phones and they can be answered regardless of the geographical location or the time of day. What is more, using the platform was an efficient way of collecting data, since it has data already in textual form. In addition, Webropol service provides ready to use reports in PDF file form which makes downloading easy.

The questionnaire (Appendix I) was created in Finnish. It was a semi-structured questionnaire which and it contained both open and closed questions. The purpose of the questionnaire was to take into account of how teachers benefit from the use of technology in teaching, how the training facilitates them to incorporate technology into teaching and how the participants in general terms perceive the use of technology in education. These questions are related to how teachers integrate their ICT-skills in the classroom, and how the training supports their actual task of teaching with technology, which may include some particular skills in using software or some educational technologies. It is also imperative to the research whether the training involves some particular school subject or is it generally applicable irrespective of the subject matter.

The questionnaire consisted of three sections 1) two open questions concerning education and work history 2) five structured questions concerning the form, content and the priorities of the provided training 3) three open questions concerning technology's role in education.

The easy background questions at the beginning of the survey help the respondent to tune in to the topic before the actual questions, in addition to providing background information necessary for the study (Valli, 2018). The open questions were:

How did you arrive at providing in-service training?

Describe your occupational history.

Section 2 contained first multiple-choice questions concerning participants' professional interests, including statements as follows:

I follow the latest ICT news / education news.

I follow professional literature and publications in ICT / education.

The next question enquired whether the provided training was concerned with particular technology and was that technology originally intended for educational use, as described in the previous section (6.1.1) of this thesis.

The following question queried about the form of training and presented the following options:

Volunteer based

Continuous

One off training

VESO training.

The next question was a 5-point Likert scale question pertaining to how important the presented issues were for the participants. Likert items are used to measure respondents' attitudes to a particular question or statement. There were seven alternatives in the question, for example group work, learning theories, learning by doing and co-operative planning. To analyse the data and to make the reporting of the findings easier, I coded the items as follows:

- 1 = Not important
- 2 = Slightly important
- 3 = Moderately important
- 4 = Important

• 5 = Very important

Section 3 contained three open questions which were concerned with the technology's role in education:

How do you understand technology's role as supporting learning?

How do you see technology use by the teachers?

How do you see technology use in work community or school?

Before the main data collection phase, a pilot questionnaire was collected to test the data acquisition protocol. The pilot questionnaire included answers from one in-service educator, participant A. Based on this pilot questionnaire and the subsequent analysis, one additional open question was added into section 3:

How do you see teachers' demands in terms of digital competencies?

The privacy of participants and ethical principles were handled with care. As an author and collector of data I was the only one who had access to data. What is more, the audio recording of the interview did not include any questions of participants' identities. According to Webpropol Oy data statement, the data is acquired from users of Webropol software with their consent and any contact information provided is not transferred to third parties. The questionnaire was presented with a link to a data protection notice required by the General Data Protection Regulation, so that the respondent may check how the personal data they provide is processed. The questionnaire was also accompanied by notice that even though the questionnaire contains a form for personal data such as name and email address, data will be analysed and published anonymously, and any personal data is intended only for possible interview purpose. There was in addition an invitation for a possible interview at the end of the questionnaire, which could be filled on a voluntary basis. After the present research is completed all the information and transcriptions of interviews will be erased.

### 6.1.3 The interview

As discussed previously, the data collection was done both by the electronic questionnaire and an interview with participant B. According to Kvale (2018), interview is a conversation which purpose is to acquire knowledge and descriptions of interviewee's "life world" with the aim of

interpreting its meaning as it pertains to the research phenomena. The information obtained in the interview is socially constructed, and according to Kvale and Brinkman (2015), interview knowledge is created in the interaction between participants of the interview, using language for obtaining the information.

Since the basis of the interview was the questionnaire, the interview proceeded as semi-structured interview in order to maintain the structure of the data acquisition largely the same. However, using interview as a data collection method provided to be beneficial since it allowed for supplementary information to be gathered. While the questions regarding technology integration are exceedingly theory-driven, it was imperative that the participants' voices were heard, and the interview process provided the flexibility necessary for that. Flexibility, therefore, is a key advantage of semi-structured interviews, which not only allows for leaving space for participants to provide new insights but also makes possible for the interviewee to reciprocate and specify answers (Sarajärvi & Tuomi, 2018).

The ability to specify answers during the interview provided to be useful. On several occasions I managed to specify some answers so that the participant B could elaborate on the topic, for example after answering question about technology's role in supporting learning, the topic of adaptive learning systems came up. This was then followed by a specifying follow-up question: "How near or far would you see this technology to be?"

### 6.2 Qualitative theory directed content analysis

The methodology used in this research will be discussed in the present section. As discussed previously, the chosen tradition of research in this thesis is qualitative methods of research, and more specifically theory directed content analysis. Qualitative methods of research were chosen because as a student in field of Education, I found our roots of research are deeply embedded within this tradition and is therefore extensively used in in students' thesis as well as in published, peer reviewed papers. Moreover, the understanding of the phenomena was primary in order to better describe and analyse the phenomenon under research, e.g., the perceptions and experiences of the participants in the research. Consequently, qualitative methods of research seek explanations of phenomena through peoples' experiences and the method of content analysis provides understanding and knowledge of the phenomena (Shieh & Shannon, 2005).

Content analysis research method uses systematic classification as a means to subjectively interpret the contents of research data (Hsieh & Shannon, 2005), which is done by identifying codes and common themes. Content analysis as a research method ranges from the intuitive and interpretive analysis to the systematic and strict. It is, in fact, a family of varying analytic approaches and therefore very flexible. (Shieh & Shannon, 2005) Within this family there is a range of approaches to analysing the phenomena, but also a varying stance towards theory. While using content analysis, systematic classification and interpretation of the content of text data is possible through the process of coding and identifying patterns or themes without using any background theory. On the other hand, content analysis does not prevent using background theory to guide the analysis. Tuomi and Sarajärvi (2018) remark that the analysis is guided by pre-existing concepts and theories which provide categories used in the analysis. This stance is corroborated by Hsieh and Shannon (2005) who assert that upon the existence of prior theory, directed qualitative content analysis is appropriate, particularly when the purpose of the research is to "confirm, expand, or refine this existing understanding of a phenomenon". Therefore, the method of analysis used in this study was further limited to theory directed content analysis.

### 6.3 Analysis

The process of data analysis begun with analysing the pilot questionnaire in order to pre-test and refine the method before applying the process to all of the collected data. Following Hsieh & Shannon's (2005) notion of building initial coding structure, the first step of the analysis was to apply the existing theory into the coding process. In order to generate the initial coding structure, the theoretical framework presented in this thesis was to be systematically deliberated in order to identify key concepts or variables as coding categories (Hsieh & Shannon, 2005).

The initial coding structure contained the TPACK knowledge areas as well as keywords of best practices in continuing education presented in Table 3. Each code was assigned an operational definition, i.e., how the code is defined, what are the associated keywords and coding rules (Hsieh & Shannon, 2005). The coding process begun by creating labels or codes which can be seen in Table 3.

**Table 3.**

*Initial coding structure.*

| Coding of TPACK knowledge areas | |
|---|---|
| | Content Knowledge |
| | Pedagogical Knowledge |
| | Technological Knowledge |
| | Technological Pedagogical Knowledge |
| Coding of teachers' professional development | |
| | Active |
| | Coherent |
| | Curriculum based |
| | Job-embedded |
| | Reflective |
| | Sustained |
| | Research oriented |
| | Co-operative |
| | Supported |

The second step of qualitative content analysis process is called *reduction* (Tuomi & Sarajärvi 2018). This was done in order to immerse oneself to the material, thereby reading the material several times over to identify which passages of text, or units of analysis belonged to which predetermined code according to the predetermined keywords and coding rules. The purpose of this was firstly to reduce the material into manageable size where all the relevant units, i.e., words, a sentences or entities made up by several sentences (Tuomi & Sarajärvi, 2018), were coded and everything else was discarded. Secondly, it was a way of connecting the qualitative material to the theory to see how certain connections are emerged and actually to think alongside with the theories (Salo, 2015). After this, the reduced phrases are sorted into groups according to the initial coding structure.

Following this step, it was discovered that some of the interesting passages weren't easy to label to the pre-existing ones. However, as Shieh & Shannon (2005) remark, data can also be coded during the analysis if there are cases where the data cannot be assigned to a pre-existing code

or it cannot be determined if they represent such code. Therefore, I created some new codes as follows:

Teacher demands

Limited resources

Possibilities of ICT

After the initial coding of the material, the coding structure was revised, and the codes were formulated into coding agenda (Mayring, 2000) with category definitions, prototypical text passages and rules for distinguishing different categories. Example of such coding agenda can be seen in Table 4.

**Table 4.**

*Example of coding agenda.*

| Category | Definition | Examples from the data | Coding rules |
|---|---|---|---|
| C1: Rising demands and expectations from teachers | Teachers need and are expected to learn ICT and use it effectively in classroom | *"Opettajien tulisi tänä päivänä olla melkoisia digitaitureita hyödyntääkseen teknologiaa monipuolisesti"* | Words such as should, if and when |
| C2: Anything is possible with ICT | ICT offers limitless possibilities to teach and use in schools | *"Melkein kaikki on mahdollista, jos on intoa ja halua panostaa siihen"* | Words such as possibilities and anything |
| C3: Limited resources | Professional development is limited by time, money or other factors. | *"jos on intoa ja halua panostaa siihen."* | Words such as time, money, resources, motivation, effort and willingness |

As can be seen from Table 4, the example of coding agenda used contains samples of the text which were the basis of creating new categories. They are what Assarroudi et al., (2018) call anchor samples, "an explicit and concise exemplification, or the identifier of a main category". These were supplemented with definitions of the categories and coding rules. Pre-testing the pilot questionnaire has thus made possible to refine the coding structure and to formulate a

coding agenda for the categories to be used in analysing the remainder of data. Following the pre-test phase, it was time to perform the main data analysis, which was done similarly to the pilot questionnaire while applying the revised coding agenda. The results of the main data analysis are discussed in the following chapter 7.

# 7 Results

In this chapter the results of qualitative theory directed content analysis based on semi-structured questionnaires and an interview will be presented. The following sections discuss the results of the study in wider perspective, connecting them with previous studies and the theoretical frameworks used in this study. The research questions will be discussed in their respective sections, which have subsequently divided into several themes. The themes comprise of the most prominent categories from the coding agenda which will be presented next.

The results of the main data analysis can be seen in Table 5. The purpose of this table was to provide a general description of the features in the data in the form of the final coding agenda that was used in the analysis. The table includes all the codes in the initial and revised coding agenda, hence displaying which codes were used in the main data analysis

**Table 5.**

*Results of the coding organized by number of instances in the data.*

| Category | Number of occurrences | Definition |
|---|---|---|
| C1: Rising demands and expectations from teachers | 26 | Teachers need and expect to learn ICT and use it effectively in classroom |
| C2: Possibilities of ICT | 19 | ICT offers limitless possibilities to teach and use in schools |
| C14: Co-operative | 15 | Networking and co-operation, co-operative planning of training |
| C7: Technological Pedagogical Knowledge | 11 | Teachers' knowledge of how various technologies can be used in teaching and understanding that using technology may change the way an individual teaches |
| C13: Sustained | 6 | Long term programmes with follow-up support |
| C17: Theory-based | 7 | Based on learning theories and philosophies about adult learning |
| C5: Pedagogical Knowledge | 5 | Deep knowledge about the processes and practices of teaching and learning, including educational purposes, goals, values and strategies |
| C4: Content Knowledge | 4 | Knowledge about the subject matter be learned or taught |
| C8: Active | 4 | Teachers are active during the training and planning |
| C19: In-service educator's role | 4 | How in-service educators perceive their role |
| C12: Reflective | 4 | Teachers have sufficient opportunity to reflect on learning and teaching as part of development activities |

| Category | Number of occurrences | Definition |
|---|---|---|
| C6: Technological Knowledge | 3 | Deep, essential understanding and mastery of technology for information processing, communication, and problem solving |
| C11: Job-embedded | 3 | Focus of training is in practical classroom work |
| C18: Supported | 2 | Supported by teaching community and administration |
| C3: Limited resources | 2 | Professional development is limited by time, money or other factors. |
| C9: Coherent | 1 | Coherent, integrated and logical approach to instruction. |

In addition, table 5 provides a numerical glance how the coding agenda has been populated by excerpts from the material, for instance the most prominent categories as well as the least populated categories. As can be seen, the most populated categories were C2, C1 and C14 while the least populated categories were C11, C9 and C3. The quantification of the codes, however, are not the entire result but instead they function as a guide to locate the most prominent issues that have emerged from the data which, in turn, serve as a basis for discussion. It cannot, therefore, be used to make any conclusions such as that "the providers have incoherent approaches to in-service training that lack the connection to classroom practices", based alone on certain code's prevalence. In the following subsections, the most prominent categories are discussed in context using background theories when needed, while taking the aims and research questions into account.

### 7.1 The task and role of in-service educators

Since the phenomenon under research in this thesis is the perceptions of the providers of in-service education, and the aim is to research this phenomenon comprehensively, it is crucial to investigate how the participants perceive their own work as in-service providers. As discussed in chapter 6.1.2., the questionnaire included two open questions about the participants' educational and occupational background and five closed questions pertaining to their views on the kind of training they provide. In addition, the questionnaire included one question that queried what the participants view as important in their training. As discussed in chapter 6.1.1. about the participants background, they all come from the field of education, and are predominantly trained and experienced teachers. However, none of the participants answered as having any ICT-related qualifying education or degree.

The questionnaire queried into about how they arrived at providing in-service education. Common ways to get involved in in-service education were by participating in a project or "*experimenting*" with either technology or training among colleagues. The participants A and C stated that while they worked as a teacher, they either "*discovered*" or "*got interested in*" in-service training by providing some form of training sessions to their colleagues, which in turn led to further requests to provide training outside of school. Four participants (A-D) stated they were involved in a project concerning either ICT or other development task. The participants described how they were propelled into ICT-related in-service education on the grounds of personal interest towards technology or using technology to facilitate teaching:

> "*... job description started to steer towards digital and ICT training by chance and personal interests*" (Participant C)

> " *I got really excited about the use of social media technologies and computers to support learning and teaching*" (Participant A)

The participants have varied occupational history, and in addition of having worked as teachers and in-service trainers, participants have been employed in business, sales and marketing, development, various projects and in field of education, both in the private and public sector. Their current positions as providers of in-service education are equally varied, since three of the participants are self-employed, one continues working as teacher while also providing in-service training and one is employed in the private sector.

These findings were very much in accord with the research literature about the complexity of in-service education providers in Finland discussed in chapter 2. So, too, the participants of this study represent this variety. With respect to the participants' background, I find this an interesting result, since on one hand it portrays the heterogeneity of the participants professional situation, but on the other hand there are certain commonalities between them. Each has had individual motivations and career paths towards providing in-service education, yet they all have entered their profession from the field of education rather than, say, the field of science and technology.

This result suggests that providing ICT-related in-service training to teachers is approached, at least among these participants, from the viewpoint of educational background. Moreover, as respondents have commented, technology has become a part of their job descriptions through

personal interests, hobbies and work-related projects relating to ICT, and any subsequent qualifications, degrees or programmes specific to technology have been acquired after their initial degrees. These results are significant on themselves, since none of the studies I have encountered have explored the background of the providers of in-service.

Education as their primary field of interest is further emphasised in their answers to question about their professional interests. The participants were asked about their professional interests in a multiple-choice format, such as whether they follow ICT or educational news, literature and publications and whether they are active in the social media. All of the participants answered they follow both educational news and scientific literature as well as the latest news from ICT. What I consider significant is that scientific literature and publications were markedly less followed as 66 percent of the participants answered positively.

All of the participants were active in social media and the most commonly used social media platforms were named as Facebook and Twitter. In particular, participant B stated in the interview that Facebook was primarily used in marketing purposes while other uses were currently limited.

In terms of the range and scope of the technological knowledge, providers of in-service education offer training in number of technologies, devices and software such as VR-glasses, augmented reality solutions and learning environments such as Microsoft Teams. Two participants (d and a) described their offering as "versatile" while participant A used expression such as "*at least dozens*" of technologies and "*at least a hundred*" different applications. The impression from the results was that the providers are prepared, in terms of technical know-how, to offer a wide-ranging variety of in-service training.

The most significant commonalities among participants were that they firstly tend to prefer free software such as those provided by Google, and secondly that only few of the technologies used in training were originally intended for educational purposes. From the 7 participants, only participant F stated that the technology used in the in-service training was originally intended for education.

Participant B provided grounds for using Google as follows:

> "*I've always emphasised using free software. In practice, most of it has been done with Google tools…"*

The participant then proceeded to explain that although there are other alternatives that are easier to use and with better functionalities, they are not free of charge. Participant B views the money as an issue and stresses the importance of the content of the training rather than the technology used to implement the training:

> "*I've wanted the idea and the thought to be easily replicated anywhere without question about money, for instance."*

The second commonality among the participants, using technology not originally intended for education, is a well-known issue in research literature. Most of the technologies today are "produced for business, entertainment, communications and social-interaction purposes" (Sahin, 2011). In fact, educational technology is a niche category, having the market size around 140 million euros in 2015, when considering the field of technology as a whole with its trillion-euro industries (Docebo, 2016).

## 7.2 Perceptions about technology integration into teaching and learning

This section of the results presents the findings concerning the first research question: How do the providers of in-service education perceive technology integration into teaching and learning? This question concerns with how the use of technology in teaching is seen by the participants, and therefore explores the role of technology in teaching and learning, along with the impact of rapid development of technology. The present chapter will first delve into the advantages and disadvantages of technology in educational use, and then discuss the development of technology and how it affects teaching and learning.

### 7.2.1 The possibilities of ICT in education

As the participants were providers of ICT related in-service education who were asked questions related to technology use in teaching, possibilities of ICT emerged as the most prominent category from the results. Within this category there were several topics that were addressed by the informants, including the pros and cons of technology use in education and technological development.

The respondents were asked about the use of technology in education, particularly concerning its advantages and disadvantages. The list of technology's affordances and possible benefits to

teaching and learning proved to be substantial and while it is not constructive to provide a comprehensive list as regards to aims of this study, it is necessary to describe and discuss the findings. Based on the participants' answers to the open questions, the advantages of technology can be described as diverse and versatile, having potential to "*streamline many tasks*", "*motivate*", "*diversify study methods and ways of learning*", in addition to allowing for tasks such as "*communal learning*" and extensive co-operation. Although the respondents did not mention any specific instructional activities, the range of technological affordances was considerable in scope as in variety.

The disadvantages of technology use in education were similarly diverse, although the respondents' answers concentrated on the general use of technology and not specifically on its educational use. The disadvantages can be characterised as relating to issues concerning life management such balance between work and recreation and the amount of screen time which, according to one participant, may affect sleep.

### 7.2.2 Digital inequality

One respondent, participant A voiced a concern over digital divide or digital inequality, "*digisyrjäytyminen"* in Finnish. According to the participant, digital inequality may be an issue among young people who may not have the necessary technological skills to manage in life, and schools should provide them the requisite skills for them to cope. Digital inequality is in fact a genuine concern in modern developed society. According to van Dijk (2006), digital divide has been used to denote the gap that exists between people that have or do not have the access to computers and "new forms of information technology". In an attempt to formalise the concept, van Dijk has segmented digital divide into distinct categories based on what kind of inequality of access to and use of ICT is being discussed. Van Dijk asserts that digital divide concerns not only with material access, but also with motivational, usage and skills accesses. The participant's concerns over digital divide were stated as regards to inequalities in skills access, which according to van Dijk (2006), tends to grow in developed countries. What is more, based on the studies carried by Hargittai (2002, as cited in van Dijk, 2006), divides of skills access are greater than divides in technological access, and therefore the variability among individuals' digital skills is greater than their access to computers or other digital devices. Van Dijk further explains that the skills required for improving individual's position in society or achieving other particular goals are associated with strategic skills in using ICT. So, according

to Hargittai (2002, as cited in van Dijk, 2006) in order for young people to bridge the digital divide schools would need to focus on supporting students' strategic digital skills in addition to basic computing skills.

### 7.2.3 The evolution of technology in education

The development of technology itself was seen both negatively and positively. Information technology offers many opportunities in teaching, but the development of information technology also means that new devices and applications are constantly being added. For example, as stated by participant A, there is a tendency to move on to new ones while not giving up the previous technology. At the worst, this can mean that when a teacher has taken the time and effort to learn how to use a particular software or device, it becomes obsolete while a new and updated version is introduced. Developing digital competencies requires learning but also, according to participant G, putting aside what they already know:

> "*Teacher has to be prepared in continuous learning and "unlearning" so that they can offer their students the tools and skills for future challenges*" (Participant G)

What is meant by that is, essentially, that the learning does not end when a teacher has learned to use one particular technology but is constantly required to learn new skills as technology keeps developing.

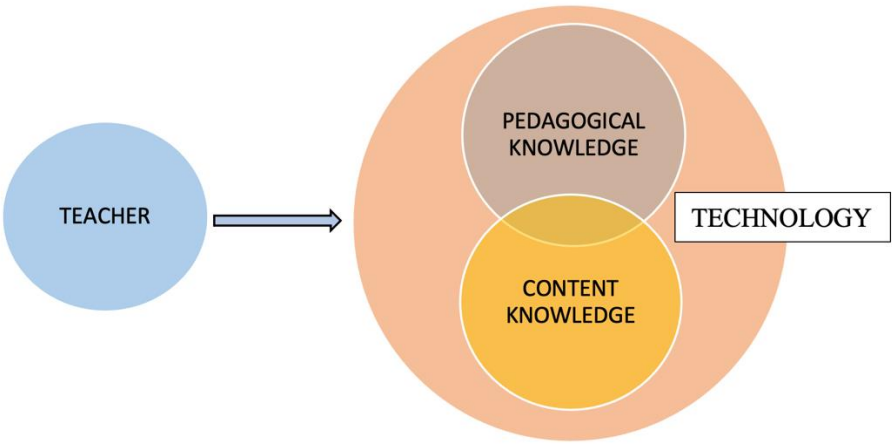
As discussed previously, the role of technology is to facilitate teaching, but technology is constantly evolving, and so, too, does technology used in education. A certain issue that emerged from the data was that when technology advances to certain level, the ways schools and teachers organise their education will change drastically. Two participants (B and C) suggested the adoption of adaptive learning materials and virtual teachers in the future. Virtual teacher, according to one participant, is system based on artificial intelligence that is functioning as a teacher. Such virtual teachers are capable of, at least according to a study by Edwards & Cheok (2018), "tireless labour" while having the ability of displaying personality with sufficient instructional and social interaction to teach in a future classroom. Adaptive technology, or adaptive learning on the other hand, is based on the idea that the system adapts itself and the learning methodologies to suit students different learning styles and provides an individualised way of teaching. This

allows for students to learn more effectively, faster with the added benefit of greater understanding of the subject matter (Jones & Jo, 2004). There are a number of ways of achieving adaptive systems, for instance through software with computers or with distinct technological devices such as eye tracking devices that detect and analyse learner's performance or affects such as boredom and excitement and thereby accommodate the tasks and learning objects to suit the learner's current state (Shute & Zapata-Rivera, 2007).

This raises the question of what it means when the level of technology has reached this threshold? According to participant B, the "*substance of teaching*", will be automated and controlled by the particular technological device or software in question. To further elaborate this situation, it will be discussed in terms of TPACK framework presented in chapter 3.1. As noted, the Technological Pedagogical Content Knowledge comprises of three distinct elements that can be developed in order to teach efficiently with technology. In the present scenario, two domains, Pedagogical and Content knowledge areas of teaching have been automated by the computer system and thereby integrated within the technological knowledge area. The scenario may be described graphically as something such as the following Figure 3.

**Figure 3.**

*Schematic of adaptive learning system explained via TPACK framework.*




In the Figure 3, both Pedagogical and Content knowledge areas overlap, but the Technological knowledge area has been omitted, with the effect that the originally used TPACK framework has been transformed entirely. The actual task of teaching is handled by technology, which in turn is overseen by the teacher whose task is to plan and organise instructional activities according to curricular needs. This is in accordance with Edwards et al., (2018) view that the

teachers' "roles may shift toward overseers who design and select machine-led instruction, monitor student progress, and provide support".

Although the respondent pointed that *"The technology will be the teacher in the future, how the teacher is defined"* (participant B), it is to be noted that the setting above does not cover all of the responsibilities of teacher, but rather the instructional and pedagogical side from the viewpoint of technology use in education. Using sufficiently developed technologies such as adaptive learning systems and virtual teachers enable for the teacher to orient more towards the core task of teacher profession, which the respondent stated is "*to inspire and provide example*". In Finland, teachers aim to support the pupils' holistic development which acknowledges their social, emotional and spiritual concerns rather than merely the cognitive development (Tirri, 2011). Thus, there is a wide variety of teacher's responsibilities which cannot be accounted by virtual teachers or adaptive learning systems. It can be reasonably stated that no foreseeable technology can replace human involvement in the multitudinous task of supporting pupils' growth and development. Nevertheless, as the demands for teachers' technological competencies can be greatly reduced, teachers would be able to focus on their core function as discussed above.

## 7.3 Perceptions on developing the knowledge and skills needed for efficient classroom ICT integration

The present section of the results presents the findings concerning the second research question: How do the providers of in-service education perceive *developing* the knowledge and skills needed for efficient classroom ICT integration? The results to this question were concerned in particular with participants' thoughts on teachers' expectations to take responsibility of their own professional development. Another notion associated with professional development was about co-operation, which was seen as instrumental in helping teachers to develop their digital competencies. While discussing these results, the views of what constitutes a quality in-service education, as discussed in chapter 4 will be taken into consideration.

### 7.3.1 The participants' views on best practices and barriers in professional development

As discussed in section 4.1 about the best practices and barriers to teachers' professional development, the present thesis includes the results of how the participants perceive these issues.

While some of these issues have already discussed in this thesis, I have attempted to summarise the findings in the Table 6, where the section concerning in-service training in Table 1 was compared with the data to see whether these issues were present in the research material.

**Table 6.**

*Characteristics of provided in-service education.*

| | Best practices | Present | Absent | Inconclusive |
|---|---|---|---|---|
| 1. | Relevant to individual needs | x | | |
| 2. | Authentic classroom environment | | x | |
| 3. | Centred around practical, classroom problems | x | | |
| 4. | Curriculum-based learning | x | | |
| 5. | Based on adult learning theories | x | | |
| 6. | Coherent | | x | |
| 7. | Opportunities for critical reflection | | | x |
| 8. | Active | x | | |
| 9. | In-depth | | | x |
| 10. | Co-operative | x | | |

As can be seen in Table 6, majority of the practices associated with quality in-service education are present in the results, while two categories were absent in the data and three categories were inconclusive. Since the questionnaire was designed so that it contained both open and closed questions, some of these results were obtained through the multiple-choice questions while others through participants' descriptions in the open questions. However, there is not a one-to-one correspondence between the multiple-choice questions and the items on Table 6. Next, I will discuss these findings in detail in order to provide some insight into the results, with the support from the participants' perceptions from open questions.

The participants were asked to describe the training they provide, given the following alternatives:

1) I aim to take teacher's individual skills and development into consideration

2) I aim to organise training in a classroom or authentic environment.

3) I aim to offer training directly related to instructional practices

4) I aim to take into consideration the Curriculum when planning in-service training

These questions correspond to the first four items in Table 6. All of the participants answered positively into 3rd option while 75 % of the participants answered positively to 1 and 4. What is remarkable is that none of the participants answered positively to option 2 which related to training in a classroom or other authentic environment. As can be seen, participants are concerned with the training being job-embedded and centred around practical classroom problems, and one respondent, participant G stressed the importance of training being connected to actual teaching practices and it being "curriculum proof". Nevertheless, the training appears to be situated outside the classroom; the place the teachers will be going to apply their education. Moreover, the majority of the respondents take the individual needs of teachers into consideration, although the open questions did not provide any further grounds for their opinions.

The fifth item in Table 6 deals with the participants using adult learning theories and research-based knowledge to support and design their training. This issue was partially answered by the questionnaires question 14, a Likert-scale question that inquired how important the participants saw certain aspects in their training. Among the five participants who answered this question, three considered it as important and one considered it as very important while one thought of it as moderately important. One participant commented on the learning theories as follows:

> "*During short duration training learning theories are not something we have time of, as the emphasis is on the use of tools*" (Participant A)

Other respondent, participant C mentioned specifically social constructivist learning theories, as they are closely linked to learning-by-doing and learning from others.

When considering the sixth item in Table 6, the data contained no instances associated with coherence or any integrated and logical approach to instruction in in-service education. Similarly, as regards to the seventh item, there was no indication that during the in-service training teachers were given opportunities to reflect on their learning. I find that data was inconclusive in that regard, although participant A remarked that the learning occurs only after teachers' training session.

The eight-item dealt with the role of teachers co-operating in the planning and execution of in-service training. This was again answered in 14$^{th}$ question in the questionnaire, where the participants could place value to its importance. From the five respondents, two considered it as

moderately important, two as important while one thought of it as very important. They grounded their reasoning by explaining how they enable teachers to participate. Among others were that they usually go through the training plans so they can be potentially changed and sometimes they vote on what technologies they are going to study. Participant A stated that they sometimes allow for the teachers to decide on the contents of the webinars, although they frequently plan the contents of the training with the administration and headmasters.

The penultimate item 9 (In-depth) in Table 6 is closely related to the extent and duration of the training. Since short training sessions allow for only superficial adoption of knowledge and teachers are in need of long-term professional development programmes, as discussed previously. In terms of duration and the format of training, the providers of in-service education offer both short-term and long duration training programmes, although one-off sessions are emphasised in the open questions and the interview. This is particularly evident in expressions such as, "*mostly one-off training*", "*heavy emphasis on one-off training*" and "*I have a lot of one hour to one day training sessions*". Participant B placed much emphasis on the single-event nature of the training as follows thus: "*you go to each school once and you will never come back*". However, the multiple-choice section had alternative results. The questionnaire contained a multiple-choice question about the forms and duration of provided in-service training. The percentages of each provided alternatives can be seen in Table 7.

**Table 7.**

*Question 9 responses breakdown.*

| The provided training | N = 6 | Percentage |
|---|---|---|
| Course-based education | 6 | 100% |
| Long-term | 6 | 100% |
| Voluntary | 5 | 83% |
| VESO-training | 4 | 67% |
| One-off training | 4 | 67% |

As can be seen from Table 7, all participants who answered the question offer long-term and course-based programmes. The proportion of one-offs and VESO-days are markedly less at

67% and consequently one third of the participants do not have them in their repertoire. In addition, the majority of the training is done on a voluntary basis, at 83%.

In order to characterise the results, it can be said that all participants provide long-term programmes, and two thirds provide short-term programmes. It is to be noted that in Finland, approximately half of the continuing professional education is done within VESO-training, as discussed in chapter 2. What can be inferred, therefore, is that one third of the participants provide training for the teachers who are developing their competencies outside of compulsory VESO-training. These results imply that the providers of in-service education cater for the group of teachers that are already interested or motivated in developing their competencies, consequently seeking into in-service education on a voluntary basis. As Helin (2014) notes, education can be described to have accumulated since the same persons repeatedly apply for continuing professional development programmes while some teachers entirely miss out in-service education.

To provide an answer to the 9th item in Table 6, it has to be stated that in cases when the teachers participate in short term or one-off training, for reasons stated above and extensively in chapter 4, the thoroughness may by questionable. However, when participating to long-term programmes, they are certainly receiving in-depth and quality in-service education, which includes instruction in various technologies (as discussed in section 7.1) without forgetting the pedagogical viewpoint provided by professionals in education.

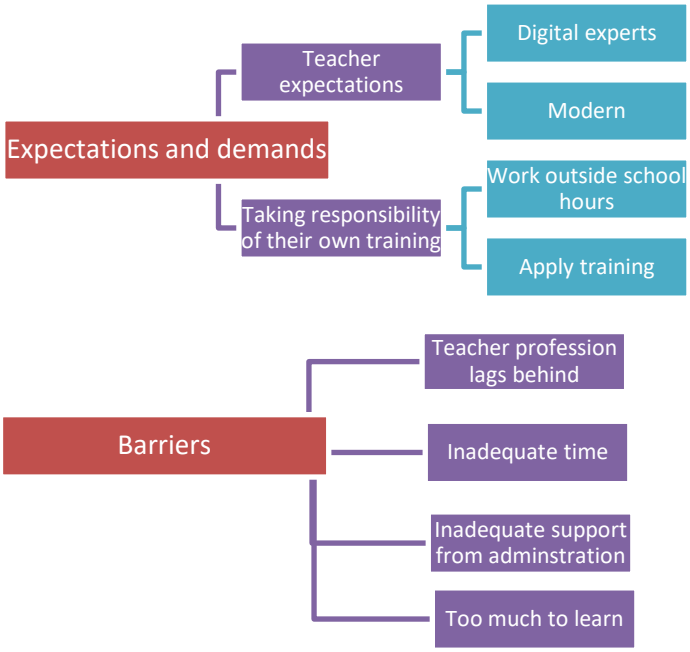
As for the final, 10th item in the list, the results were unambiguously positive. The results contained many instances of co-operation occurring both during in-service education and in the daily work of teachers. In fact, it emerged as instrumental in developing digital competencies. Co-operation will be handled further in section 7.4 of this thesis, where notions of peer teaching, co-operative planning and learning communities, among others, will be discussed.

### 7.3.2 Teachers' expectations and demands

One of the most prominent issue which emerged from the findings of the present research is associated with teachers' expectations and demands concerning the use of technology and developing digital competencies through in-service education. The results covering teachers' expectations and demands along with their respective barriers are presented in the Figure 4.

**Figure 4.**

*Teachers' expectations, demands and barriers.*




As can be seen from the Figure 4, the providers of in-service education acknowledge the teachers' concerns about teaching with technology from several points of view. On one hand, teachers may experience expectations as teaching professionals to be modern, versatile and accomplished in their work and, on the other hand, take responsibility of their own professional development. According to participants:

> "*Teachers today should be digital experts in order to take advantage of the technology in a versatile manner."* (Participant A)
>
> *"Modern teacher is able to take advantage of ICT in a versatile manner."* (Participant D)

As can be seen, the respondents seem to suggest there is some implicit requirement for the teacher to be both *modern,* or a *digital expert* in order to use technology *in a versatile manner.* The participant uses the moniker "digital expert" ("digitaituri" in Finnish) to convey the idea that using educational technology presents a challenge by itself. These technological challenges are further supported by the statement that sheer amount of technology can "perplex teachers",

particularly as there seems to be some uncertainty among teachers as to what tools they should use in their teaching and what should be avoided. The participant indicates that the public position of a teacher necessitates a choice of what should not or should not be used, for instance commercial programs and licensing issues, such as those covered by the GDPR license for European legislation.

Expectations for the teachers to be digitally savvy are associated with statements such as ones from participant B:

> "*Teachers as a profession is perhaps one that is lagging behind the rest of the society".*
>
> *"…now we have increased demands of what we should know."* (

These assertions reinforce what has been discussed, but at the same time transpose the issue into a societal context, thereby providing possible grounds for increased expectations from teachers. Although the respondent alleviates the first statement with using the word *perhaps,* the participant next paraphrases a study where teachers were the last to adopt the use of either wide screen televisions or mobile telephones, and notes that "*in the larger scheme*" of things, teachers "*tend to be the slowest"* adopters of technology.

The results imply, concurrently with the previous findings discussed in chapter 4.1, that teachers need to take responsibility for their own professional development, particularly how they manage their own learning in the post-training period. According to participants:

> "*Learning takes place after training. After all, teachers know nothing when they leave training, but they have the tools to learn."* (Participant B)
>
> *"ultimately it is the teacher's responsibility to realize the ways to to apply (what has been taught) into his or her subject."* (Participant A)

These answers highlight the teacher's proactive role in applying the contents of the training to their work. Also, as viewed from the viewpoint of TPACK framework, the statement implicitly assumes that what is being taught is Technological knowledge and in order for the teacher to develop their overall TPACK, they would need to devote time and effort to reflect on their learning. The other significant issue affecting into teacher's increased responsibility was the demand to spend time outside school hours. Participant A answered as follows:

> "*..if one sees developing their competencies occurring only during the employer's time, they are likely to lag behind development.*"

Here the issue of professional development has been again contrasted to "lagging behind development" which conveys the message that the teachers are required to spend their own time, as opposed to employer's time in order to develop their competencies.

As most of the provided in-service education within the participants tends to be one-off or "sit-and-get-training" as discussed in chapter 7.1, without having the support from the continuous nature of the long-term programmes, these short duration sessions lack sufficient follow-up to assess and evaluate the impact of training. Therefore, the in-service training practices discussed above place the responsibilities of applying the acquired knowledge into teaching as well as evaluating their own progress into the teachers themselves.

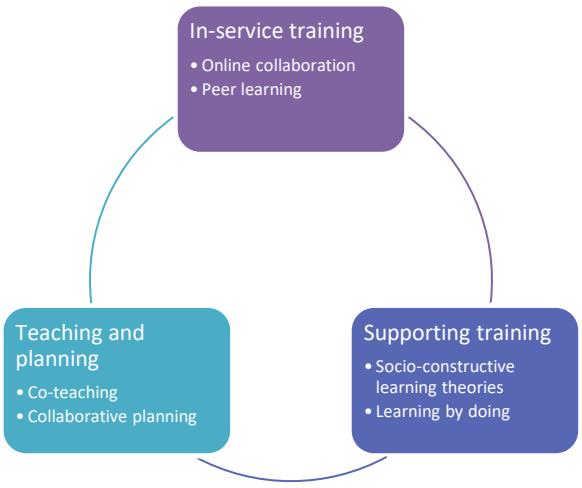
## 7.4 Co-operation

As can be seen in Table 4, co-operation and its many forms emerged distinctly from the data. It was perceived by the participants to be occurring in many domains, appearing in-service training sessions, teachers' work and as learning theories used by the participants.

The results suggest that co-operation is seen by the respondents as improving both learning and working. To describe the forms of co-operation, the Figure 5 was created to illustrate in which domains co-operation was seen as beneficial.

**Figure 5.**

*Forms of co-operation.*



Co-operation was seen as important during in-service training and in planning the in-service education. Co-operation was additionally seen in teachers' instructional practices of planning and teaching. For example, in co-teaching technology functions as a way for teachers to communicate and plan their lessons and curriculum. Technology allows for teachers to use shared documents with Google Drive, for instance to share plans and which otherwise would have to be shared in the teachers' lounge or face to face. This allows for increased efficiency since teachers can use shared documents regardless of place or time.

One example of the various forms of co-operation present in in-service training was an online training programme organised by one of the respondents, participant B. According to the respondent, the teachers participating are not allowed to enrol on the course individually or even by pairs, but the minimum size of the group is at least three.

Peer learning as a type of co-operation was stated by participant C as follows:

> "*…at the very best, one can as trainer to observe and facilitate while the learners instruct each other."*
>
> *"…members of work communities get to teach each other".*

These forms of co-operation used by teachers in training and at workplace can be described using Wenger's notion of community of practice as discussed in chapter 4.2 (see Wenger, 2011). It is a social learning theory that has been extensively used for over 20 years to describe learning as situated, collaborative practice where members of the community share and collaborate as well as expand their membership within the community (Li et al., 2009). Within the context of the present thesis, these communities of practice can be also called as learning communities. The learning community consists of a group of individuals who share common interests, knowledge and resources as well as shared access to activities and resources. Collaboration in such learning community is achieved through participation by among others, discussing and making meaning, which contributes to both collective and individual learning (Wenger, 2011).

Therefore, learning communities enable for teachers to develop their competencies both collectively and individually. For instance, if a group of school's teachers partake in a yearlong training this does not only benefit the individuals in question, but the achieved knowledge and skill may well propagate and benefit the whole community of learning, e.g., the school. Moreover, the benefit of such learning could be that the teachers' professional development happens in the

school and the members of the learning community can support each other and reflect what they have learned. This may also function as a sort of follow-up support that might not otherwise be available from the provider of the in-service training.

# 8 Conclusion

The focus of this thesis was at teachers' continuing professional development in integrating technology into teaching and learning, specifically from the viewpoint of providers of in-service education. The first research question examined how participants perceived the use of technology in teaching and the second research question focussed on their views on developing teachers' digital competencies through in-service education. This thesis used a qualitative theory directed content analysis to analyse research material based on six semi-structured questionnaires and one interview. The participants were purposively elected professionals working as providers of in-service education. The thesis used teachers' professional development and technology integration into teaching and learning as its primary scientific framework, along with the TPACK framework assisting as an analytical tool. The results were divided into three distinct sections which examined firstly the task and roles of the providers of in-service educators and subsequently the two research questions. The analysis produced several significant themes, which were discussed concurrently with the presentation of the results.

## 8.1 Discussion

The results showed how the participants view technology in teaching and learning in a contradictory light. On the other hand, teachers may experience "growing pains" with technology and its often-confusing number of applications in education. This can be seen in the way in-service educators discussed about teachers' demands and expectations regarding the use of technology in teaching. The participants acknowledged that there are certain demands on teachers about what they should know and learn for diverse use of information technology in teaching. Teachers are therefore required to be digital experts themselves in order to provide versatile education to students, albeit with the burden of being notorious for slow adoption of technological innovations. On the other hand, technology was also seen as improving education in many ways and perhaps one day, capable to supersede teachers in their task of providing instructions to students as their daily practices. Consequently, what will remain is a teacher liberated from the arduous, often rote-like process of teaching subject matter and more focused on the "core" task of supporting students' growth.

Before the advent of such technologies, teachers are expected to learn and develop their digital competencies. This involves the expertise of in-service educators, as they have plenty of tools

to offer and identify themselves as experts of digital pedagogy. They have appropriate knowledge about things digital and the know-how to mitigate teachers as regards technical issues. Their backgrounds are in the field of education, and therefore are assumed to comprehend both the pedagogy involved in teachers' profession and the challenges teachers face in aiming to teach with technology. They are, in essence, educators first and technologists second. Nevertheless, despite such opportune combination of characteristics of the providers of in-service education, there were several problems coupled with developing teacher competencies, many of which were associated as acknowledged barriers to teachers' continuous professional development in section 4.1.

The results corroborated the notions that teachers are expected to learn on their own time, take responsibility of their learning while also being active and motivated in their own professional development. The participants similarly acknowledged the teachers' increasing demands to be digitally savvy and apply versatile methods of teaching with technology.

Concurrently with the previous research as discussed in chapter 2.2, the results suggested that a large quantity of the in-service education tends to be one-off or "sit-and-get-training". The data had no implications, or was inconclusive, of the participants paying attention to teachers' learning outcomes in the form of follow-up support. This is also in line with a number of findings (as discussed in the present thesis) about teachers' perception of in-service education, in that the impact of education remains inadequate when teachers having undergone in-service training are left with their own devices to apply the contents of the training into their teaching practices.

When teachers have undergone short duration or one-off training sessions, it is imperative that they have the necessary support from administration to have teachers devote time to critically reflect on their learning. Nevertheless, as the one participant stated, the resources to do that are "a major challenge" and only "very few" teachers have adequate time to do that. Moreover, the results indicated that none of the participants aim to provide training in authentic environment or classroom which has been recognised as one of four contributing factors to failed professional development programmes (see chapter 4.1). While the research material provided no insight as to why this is the case, it can be inferred that either the question in the questionnaire was too vague and unclear or there are practical reasons why in-service training is not organised in classrooms. In any case, the question would have probably worked better if provided with explanation of what was meant by it.

Among the findings about the nature of technology used in education, it was suggested that a major part of the devices and software were not originally intended for educational use. Moreover, according to Koehler and Mishra (2011), as new technologies are seldom designed for educational purposes, this requires teachers using them to "re-design" or "subvert" their original intentions. In doing so, teachers need specialised pedagogical and technological knowledge as well as creativity and time to find new ways of using that technology. Therefore, developing teachers' technical knowledge is not alone sufficient to optimise the technology's "educational impact" (Koehler & Mishra, 2011). Therefore, there is an alternative approach in which teachers with their "deep knowledge" of pedagogy and curriculum content, create their own technological solutions, as needed, and tailor them to meet their demands (Koehler & Mishra, 2011). This idea of teachers as designers was proposed by Koehler and Mishra (2011) who urged those "involved in teacher professional development" to develop "techniques" that enable teachers to explore technology and allow for creativeness. Essentially teachers would become "designers" who display innovative, "playful" and creative ways to incorporate technology into teaching.

Along with these barriers to teachers' professional development, the results provided an inkling of the approach of learning communities which may alleviate these particular issues. As discussed in chapters 4.2 and 7.4, learning communities allow the teachers to develop their competencies in an authentic environment at school, working and planning with co-workers while the whole community benefits from the individuals who participate to in-service education. Although the specific term learning community was never mentioned in the research material, I have inferred that this was the idea behind the participant's words.

Now, as the thesis is completed, there were several lessons to be learnt. There were some glaring weaknesses in the design and implementation of this thesis, particularly in the design of the questionnaire and the formulation of the research questions. As a result, experienced great difficulties in trying to find the answers from the questionnaire. Firstly, as the approach of this thesis is qualitative, I realised that using Likert-scale questions or such a great number of multiple-choice questions was nearly useless when trying to gain in-depth knowledge of the phenomenon. In particular the multiple-choice questions were better suited to collect background information about the participants than about the research topic itself since they provide no insight into the reasoning behind the answers. Secondly, as a great portion of the categories in the analysis was based on the research literature on professional development, the questionnaire

failed to take into account all of these categories and had therefore no means to provide comprehensive answers to the research questions. Using open questions and the interview as a data collection method, on the other hand, provided to be much more beneficial in trying to find any answers, as the respondents were able to justify their answers.

## 8.2 Reliability and ethical considerations

In this thesis, I am committed to the principles of good scientific principles such as honesty, integrity, meticulousness and accuracy in conducting research. I consider the implementation of this research to be a learning process as accords to Kiviniemi's (2018) position. As I laboured with this research, I kept close in mind the thought that as a Masters' thesis, this was a work where learning was the primary goal and any scientific findings or advances in the field were secondary.

This work begun in autumn of 2019 when I devised the initial topic of the research and amassed the majority of the background theories involved in the study, although the process of refining background theories continued throughout the research. The pilot study was conducted in spring of 2020 for which the questionnaire was created shortly before. The same questionnaire was used in the main data collection during autumn of 2020 and spring of 2021, with only minor modifications. During the process, the research questions were refined several times, as I was pondering what the specific questions I could answer based on the questionnaire. According to Tuomi and Sarajärvi (2018), ethics is part of the quality of research and complements its reliability. Since research questions changed during and after the data collection, I consider it an ethical problem for my research. I see it as my duty as a researcher to have been better prepared in advance for such situations and planned the research accordingly.

This thesis has been done with qualitative research methods, the reliability of which can be assessed among others, by how carefully and comprehensibly the research process is described (Tuomi & Sarajärvi, 2018). I have aimed to describe the research process as carefully and as transparently in all its phases as possible, while taking into account both the sampling of participants and the collection and analysis of data. The research literature and other source material used in this thesis are in both English and Finnish. Most of the source material concerning the theoretical framework is in Finnish, whereby errors in translation may be possible.

Reliability of research is related to whether the position of the researcher influences any interpretations made in the research (Tuomi & Sarajärvi 2018). While this cannot be completely avoided, the researcher's intention was to analyse the research material as objectively as possible by trying to keep the research questions in mind and comparing the results with previous research related to the topic. Since I am a teacher and have also provided in-service training, there may have been some preconceptions about the nature and the topic of this research, but I have tried to be aware of these so that they do not affect the research. However, according to Tuomi & Sarajärvi (2018), carrying research always includes choices made by the researcher, and therefore no research is completely objective.

The cover letter of the questionnaire contained description of the purpose of the study and the ways in which the answers will be used, as well as the contact details of the researcher for possible follow-up questions. In addition, all respondents gave permission to use the information they provided in the research by participating in the survey. The questionnaire asked for the contact details of the respondents, who were promised confidentiality. The identity of the respondents cannot be identified in the completed thesis. In case the respondents themselves have written in the answers something from which they can possibly be identified, these things have not ended up in the finished work. Only the author of the thesis and the Webropol website under the GDPR Data Protection Act have had access to the answers to the questionnaires. All the research data, including the completed questionnaires and the interview recording data were kept password protected. Electronic responses and interview material will be removed after the thesis is approved.

In the questionnaire, the format of the questions may have caused errors in the results in cases where the respondents have understood the question differently from what the researcher has intended. (Valli, 2018). While it cannot be absolutely certain that the respondents have understood the questions as they were intended, data suggest that the questions were largely understood correctly. Since the wording in the questionnaire has be carefully worded and unambiguous (Valli, 2018), I have tried to formulate the questions with care. The questionnaire also contained structured questions for which answer options had been provided. In hindsight, as discussed previously however, it would have made more sense to ask only open-ended questions in the questionnaire, so that the researcher could have been able to focus on only single way of analysing the results.

The study was divided into two phases, the pilot survey, which tested the design of the study as regard the research questions, the questionnaire and the functionality of the analytical methods. The second phase was the main data analysis, upon which the rest of the material was collected and analysed. Questionnaire hosted online as a data collection method worked well, and I was able to collect sufficient amount of material for my research needs. I also consider the purposive and selected method of sampling successful, in which a selected group of suitable persons were enrolled by email and kindly asked to participate in the research. In addition to the questionnaire, I interviewed one participant, to whom I asked specifying questions.

There was some variability in the answers to the questionnaire, for instance some respondents had responded very briefly, and some had given well-grounded reasoning for their responses. I consider this to be both beneficial and adverse, since the research has been founded on well justified answers while the research material has remained brief for analysing purposes. However, the reliability of the research may have been at issue. Based on the success of the interview data in terms that the respondent could elaborate on each question and given that the respondent's answers could be reacted with specifying questions, the results of this research could have been more in-depth and profound if all of the research data were acquired through interview data collecting method.

In presenting the results, I have added citations from the material to increase reliability, which in addition help to illustrate how the results have been obtained. Moreover, this enables the reader to reflect on the reliability of the interpretations I have made. The inline citations are English translations from the Finnish language research material, and any mistakes or errors are entirely mine.

Making generalisations from small sample size has been described as problematic in qualitative research (Myers, 2000; Alasuutari 2011), and studies are often difficult to replicate (Myers, 2000). This research makes no attempt to generalise the findings from this study sample to the entire field of in-service education. This is not to say there cannot be any generalisations whatsoever, and indeed, they can be made from the interpretations of the results (Sulkunen, 1990, cited in Eskola & Suoranta, 1998), or partial generalisations to similar populations (Myers, 2000). Although these findings represent only themselves and the respective research material, I believe that the results are significant on their own right. They tell something more about the phenomenon in question than what appears in the data. Therefore, I have taken the liberty of

making interpretations and inferences from the results, what the participants have told and described about their profession and taken them into the wider context. I agree with Adelman, Jenkins and Kemmis (1980, cited in Myers, 2000) who stated that single studies contribute to the whole. Similarly, as Myers (2000) claims, small, single studies may help to achieve personal, in-depth knowledge of the phenomenon which may in turn contribute to the community. So, while this research is but one, I believe it will be among many others across time and cultures which will contribute to the knowledge.

### 8.3 Implications for future research

I have felt myself fortunate to contribute into such little researched area of study. The subject matter has proved to be both interesting and fruitful. It has, indeed, been ripe with unexplored topics and possible research questions. Simultaneously, the present research concluded with many unanswered questions. Therefore, it would be beneficial to suggest few potential topics for future research. As the study was largely focussed on how the participants view their craft and not how it is arranged in practice, it would be interesting to delve into the in-service educators' training sessions and planning. This would, perhaps, entail interviews with the providers of in-service education that concentrated on how they plan and organise the training sessions and further enquire into how they ensure the impact of the training. So far, the impact, or the effectiveness of in-service training has been researched only as accounted by the teachers rather than providers of in-service education. This is certainly reasonable, since the teachers are the ones who ultimately apply the training into their work, but I think it would be of value to find out whether the providers of in-service educators are concerned with such matters.

The present thesis made no attempts to recommend particular strategies to develop in-service education. However, as discussed in sections concerning background theory as well as in the results of this thesis, there are some obvious weaknesses in the current situation of in-service education. These deal primarily how they are organised and planned. The professional development of teachers, it seems, is emphasised by short duration sessions and there is a lack of dedicated, long-term programmes which could involve the participation of greater portion of teachers. So far, only motivated teachers who are interested in either technology or their professional growth are active in participating to in-service education, and as suggested by the results, their needs are well taken care by the providers of in-service education. As has been

discussed, however, teachers are often stressed or over-worked at their work, and cannot be expected to devote their personal time to constant learning.

What I have learned during the writing of this thesis is, then, that teachers' professional development should be as close to teaching practices as possible while occurring during school-hours in actual classroom. As my thesis has suggested, in-service educators provide their services outside of this context, and therefore provide perhaps only a similitude of the authentic experience. Fortunately, these issues have been acknowledged before, and there have been several nationwide initiatives to remedy the situation. For one, Finland's' Ministry of Education and Culture's Comprehensive Schools in the Digital Age project included a digital tutor programme which employed schoolteachers to tutor their peers in digital competencies within their school community. Based on the survey by the Ministry of Education and Culture (Tanhua-Piiroinen et al., 2019), tutor teacher programme used in conjunction with "well-organised" continuous professional development has been successful in improving teachers' confidence in their digital competencies. As can be seen, key to improving teachers' digital competencies is in engaging both the local and outside expertise working in conjunction and co-ordinating their efforts. This would entail the school as the primary place to learn, as a community of practice. It would be interesting to study how this kind of co-operation works by conducting a long-term research into the interactions of providers of in-service education and tutor teachers and see whether it benefits the learning community as a whole.

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## Appendix 1: The questionnaire in Finnish

# Kysely TVT-täydennyskouluttajille

Tämä kysely on tarkoitettu niille täydennyskouluttajille, jotka tarjoavat TVT-koulutusta perusopetuksessa toimiville opettajille. Kyselyn tarkoituksena on selvittää, millaisia näkemyksiä täydennyskouluttajilla on teknologian käytöstä opetuksessa sekä millaisena he näkevät oman roolinsa opettajien TVT-taitojen kehittämisessä.

Kysely täytetään nimettömästi ja tulokset hävitetään asianmukaisesti tutkimuksen päätyttyä.

**1. Kuinka päädyit tarjoamaan TVT-täydennyskoulutusta? ***

Voit vapaasti kertoa esimerkiksi miten, ja miksi päädyit täydennyskouluttajaksi.

**2. Kuvaile koulutustasi**

**3. Kuvaile työhistoriaasi**

Kysymyksen tarkoituksena on tiedustella, mitä olet tehnyt ennen täydennyskouluttajana toimimista, tuletko IT-alalta tai oletko toiminut opettajana jossain uran vaiheessa.

**4. Kuinka monta vuotta on kulunut viimeisimmästä tutkinnostasi?**

**5. Mitkä seuraavista asioista toteutuvat työssäsi?**

Seuraan IT-alan viimeisimpiä uutisia
Luen IT-alan tieteellistä ammattikirjallisuutta ja julkaisuja

Seuraan opetusalan uutisia
Seuraan opettajien ammattikirjallisuutta ja julkaisuja
Toimin aktiivisesti sosiaalisessa mediassa

**6. Tarjoamani koulutus käsittelee seuraavia aiheita:**

Tietyn ohjelmiston käyttämistä
Tietyn välineen tai teknologian käyttämistä
Tiettyyn kouluaineeseen liittyvää ohjelmistoa
Oppimisympäristöjä
Muita koulussa käytettäviä sovelluksia tai välineitä (mitä)

**7. Onko ohjelmisto kehitetty alunperin opetuskäyttöön?**

Kyllä
Ei
En tiedä

**8. Onko väline tai teknologia kehitetty alunperin opetuskäyttöön?**

Kyllä
Ei
En tiedä

**9. Mitkä seuraavista vaihtoehdoista kuvaavat tarjoamaasi koulutusta?**

Pyrin järjestämään koulutuksen luokassa, aidossa ympäristössä

Pyrin huomioimaan jokaisen opettajan taidot ja kehittymisen yksilöllisesti.

Pyrin tarjoamaan koulutusta, joka liittyy suoraan opetukseen

Pyrin huomioimaan Perusopetuksen opetussuunnitelman suunnitellessani täydennyskoulutusta

**10. Tarjoamani koulutus on muodoltaan**

Kurssimuotoista
Jatkuvaa
Pitkäkestoista

Vapaaehtoista
Osa opettajien VESO-koulutusta
Kertaluontoista

**11. Kuinka tärkeinä pidät seuraavia asioita toteuttaessasi TVT-koulutusta?**

1 - Ei lainkaan tärkeää 5 - Todella tärkeää

Ryhmätyö

Verkkotyöskentely

Sidonnaisuus tiettyyn opetettavaan oppiaineeseen

Oppimisen teoriat

Tekemällä oppiminen

Ilmiöpohjainen oppiminen

Opettajien osallistuminen koulutuksen suunnitteluun

**12. Voit halutessasi kertoa tarkemmin kuinka huomioit näitä koulutuksessasi.**

**13. Miten ymmärrät teknologian roolin oppimisen tukena?**

Mitä etuja tai haittoja näet oppilaan käyttäessä tieto- ja viestintäteknologiaa koulussa?

1000 merkkiä jäljellä

**14. Miten näet teknologian opettajan välineenä?**

Mitä etuja tai haittoja näet TVT:n käytöstä opetustyössä?

1000 merkkiä jäljellä

**15. Miten näet teknologian toimivan työyhteisön tai koulun välineenä?**

Mitä etuja tai haittoja näet TVT:n käytöstä koulussa työyhteisön tai organisaation tasolla?

1000 merkkiä jäljellä

**16. Kiitos vastauksistasi! Voimmeko ottaa Teihin yhteyttä ja sopia haastattelusta, mikäli tarvitsemme tarkempaa tietoa?**

○ Kyllä

○ Ei kiitos

**17. Ohessa yhteystietolomake mahdollista haastattelua varten.**

Etunimi * Sukunimi * Matkapuhelin Sähköposti *